The Engineering and Mining Journal

VOL. LXXXVI. NEW YORK, JULY 11, 1908. NO. 2.

The North Side of the Coeur d'Alene District

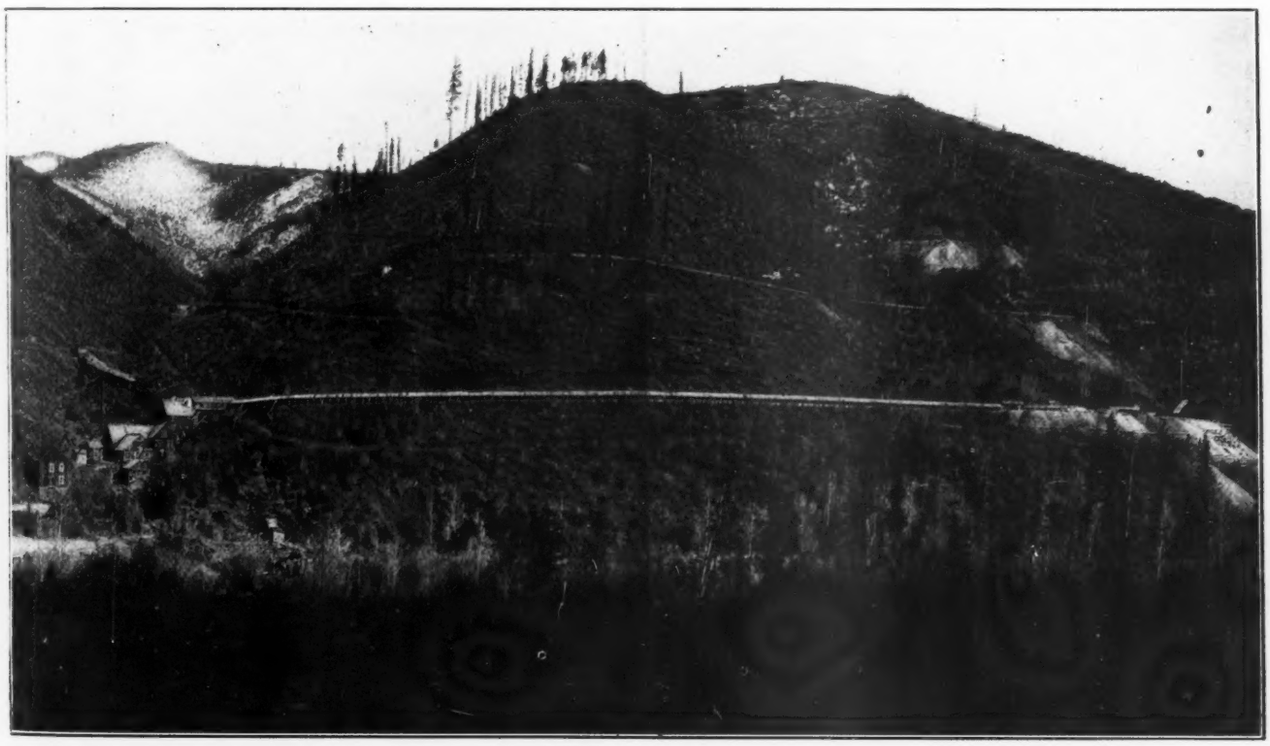
Deposits of Lead, Silver and Gold in This Region Promise to Become as Productive as Those of the More Famous South Side

BY HERBERT S. AUERBACH*

The Cœur d'Alene district embraces that mountainous region in the northeastern portion of Shoshone county, Idaho, which is drained by the North and South forks of the Cœur d'Alene river and their numerous tributaries. The North fork sweeps along the northern and western borders of the district while its southern limit is defined by the St. Joe range. To the east rises a rugged chain of mountains marking the dividing line between Idaho and Montana. These are spurs of the Bitter Root range, known as the Coeur d'Alene mountains and from them the district takes its name.

The district has been locally subdivided into the North Side and the South Side, a subdivision which hinges upon the fact that the region is traversed near its center by a ridge of mountains trending east and west and giving rise to two drainage basins, drained by the North and the South fork of the Coeur d'Alene river, respectively.

On the South Side lie Wardner, Burke, Mace, Gem, Wallace, Mullan and other camps, with their mines which have made the Coeur d'Alene famous as a lead producer, while on the North Side are Delta, Eagle City, Murray, Littlefield and Raven, all big gold producers in their day, and a large section of semi-developed mineral country destined to add greatly to the lead output of the Coeur d'Alenes, and to the gold and copper production of the district.



IDAHO HILL, GOLDEN CHEST MILL ON THE LEFT

Districts of the North Side

The mineral resources of the South Side have received occasional mention in periodicals and technical publications, while those of the North Side have never been more than touched upon. The North Side is divided into six mining districts, i.e., Summit, Cœur d'Alene, Eagle, Beaver and Union, and embraces a gold, a lead-silver and a copper belt. It comprises a succession of serrated mountain ranges and sharp ridges whose loftiest peaks rise to a hight of more than 6,000 ft. The general topography is made up of steep and rugged hills set among a tangle of tortuous valleys, intersecting gulches and narrow ravines. The angle of the hills rising abruptly from these affords excellent opportunity for deep exploration by adits, and most of the mines are worked in this manner.

The rocks of the region have been subjected to extensive disintegration; the bedrocks are covered with detritus, in many localities to a depth of hundreds of feet, and only in the most precipitous places does the unaltered country rock show up. The detritus of the highlands has been washed into the main valleys in such quantities that the larger streams possess but very slight fall, and in lower portions of their course become mean-

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dering streams. During the major portion of the year the water supply is plentiful, but with the advent of the summer, usually lasting from July 1 to October 1, the creeks run very low and at times are almost dry.

Geology

In some period of geological time this region was submerged by the Pacific ocean. Later in the earth's history the Cascade range was thrown up, which defined the western boundary of a great inland sea. During the existence of this inland sea its shallow waters deposited enormous masses of sediments. Subsequently the bed of this sea was elevated and became dry land. The sedimentaries, under enormous pressures produced by this upheaval were folded, crumpled and shattered, while innumerable fissures were formed. In this complex folding process intense heat was developed and this, in the presence of water, produced the phenomenon known as metamorphism, changing the silts and shales into slates, and the sandstones into quartzites.

Many of these fissures followed closely along the general dip and strike of the country rock, and they became channels through which hot mineralized solutions and vapors from the earth's interior found their way to the surface, depositing their mineral contents as they passed among the rocks which lined the fissures.

It was during this era that most of the gold-bearing veins appear to have been formed. At some subsequent period a series of syenite dikes forced their way through the sedimentaries producing additional folding and fracturing of strata and causing contact metamorphism in the vicinity of the intrusives. The quartzites affected were converted into dark, fine-textured rocks, of the hornfels type, and the silicious slates were altered and in places recrystallized.

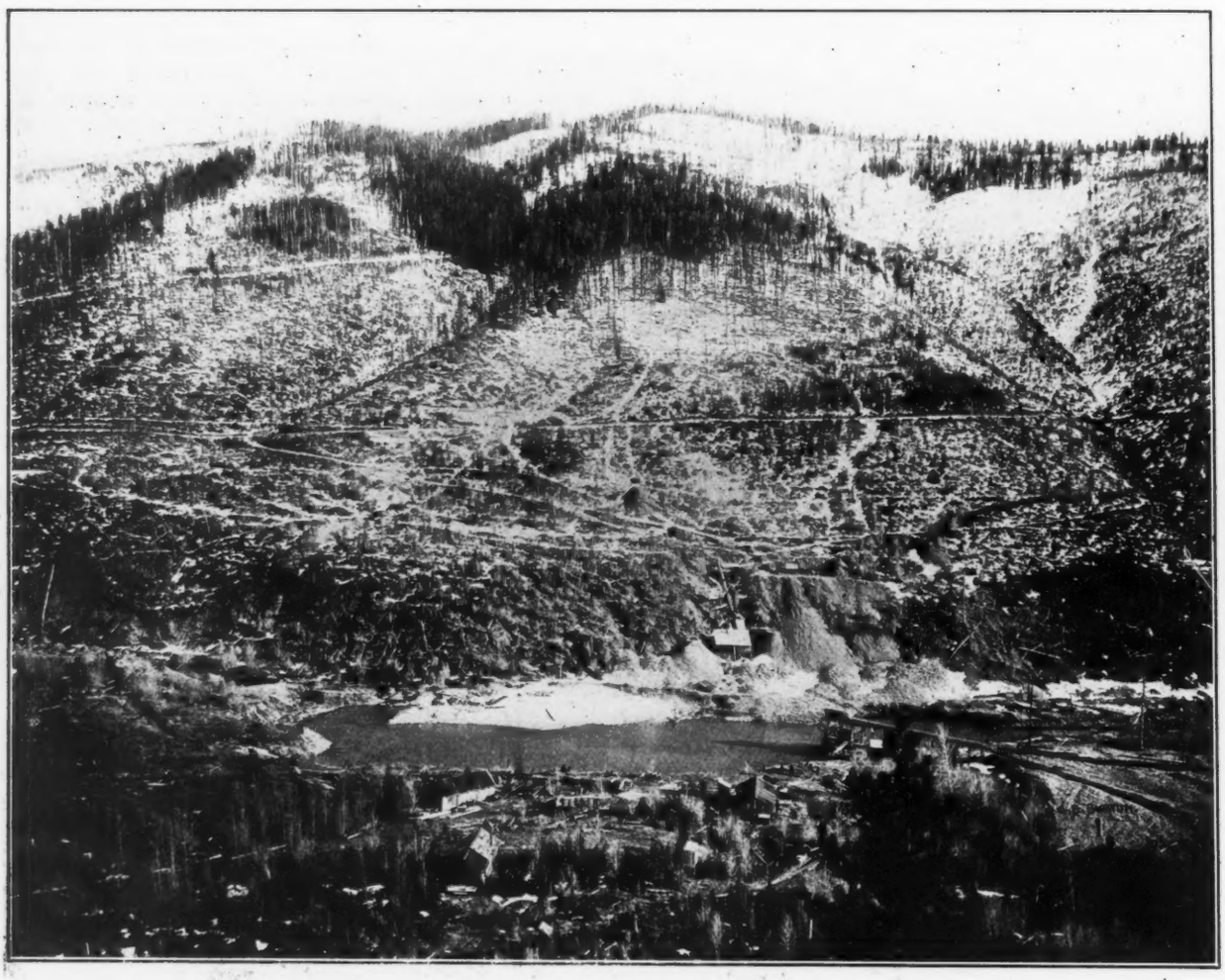
These syenite dikes possess a northeast trend, while the productive lead-silver veins strike northwest. It is probable that the lead-silver deposits and possibly some of the gold deposits owe their formation to these plutonic dikes.

Rocks of the Region

The country rock of the Coeur d'Alene region comprises a series of sedimentaries of great age and thickness, varying from shales through slates to sandstones and quartzites. The metamorphism which they have undergone has destroyed all traces of fossils, but by correlation with igneous formations Ransome has shown them to be Algonkian and Precambrian in age. Their total thickness is known to exceed 12,000 ft. These sedimentaries are probably underlain by granite and syenite, stringers of which come to the surface as dikes or laccoliths.

The Prichard slates, which cover a large area, constitute the oldest and the dominant formation of the region. They attain in places a known depth of 8000 ft. These slates vary in color from bluish black to light gray, and contain numerous strata of sandstones and quartzites.

Resting comformably upon the Prichard slates, is the Burke formation, grading from thin-bedded and light-colored sandstones to gray and white sericitic quartzites. In its widest exposure this formation shows a thickness of about 2000 ft. The Burke gradually merges into the overlying Revett formation, which consists of thick-bedded white



THE "PIT," COEUR D'ALENE PLACER COMPANY

quartzites, having a maximum thickness of about 1500 feet.

All the auriferous formations are found in the Prichard slates, while the principal lead deposits occur in the Burke quartzite, although some smaller ones are found in the Revett quartzite, and the Prichard slates.

The only known eruptives of any consequence are syenite, and porphyry. An important series of steeply dipping syenite dikes traverses the country in a northwest-southeast direction, cutting across the sedimentary formations. These dikes vary from a few feet to several miles in width, and come to the surface in many places. The largest known is the one running northeast from Gem to Nine Mile cañon and thence through Sunset mountain and into Granite and Cement gulches.

OPEN FISSURE, IDAHO HILL, GOLDEN CHEST MINE

HEAVY GOUGE, IDAHO VEIN, GOLDEN CHEST MINE

The Orebodies

The entire region has been subjected to extreme dynamic metamorphism, both regional and contact, and at the time of these disturbances the great pressures exerted caused cleavage planes and joints. These generally occur at right angles to the dip of the rock. In fresh fractures the joints are often scarcely perceptible, but as weathering progresses they show plainly, and the rock gradually falls to pieces. Although folding undoubtedly affects the deposition of ore in the gold deposits, it does not appear to influence the deposition of lead-silver ores. Faulting is very common, and in many cases due to the eruptive intrusions; the faults generally occur at right angles to these. The main structural faults appear to have been formed subsequent to the deposition of the ore.

Fissures are frequent, and generally mineralized to a greater or less degree They cut the formation in a general northwest-southeast direction, and their size in many places seems to depend upon their proximity to the intrusives.

Three general types of commercial orebodies are known: Placers and veins yielding gold, lead-silver deposits and copper ores. The vein filling of the gold deposits consists of quartzite, slate, calcite, siderite and chlorite. As a rule, the ore lies wholly in the sedimentaries, although it is known to occur at the contact of the sedimentary formation and the syenite.

The gold ores are found in veins striking north and inter-bedded with and apparently conforming in strike and dip to the country slates. In many instances, however, there is a slight difference, both between the strike and the dip of the gold veins and their inclosing strata. Although gold-bearing fissure veins occur, the general form of gold deposit is the bed vein.

Ore is found at varying intervals along the vein as "shoots" or "chimneys," the area between these shoots generally consisting of poor or barren vein matter. The shoots pitch in every direction. They sometimes occur as bodies, having a well defined lenticular or columnar shape, but are often entirely lacking in any distinct outline or regularity of form. Generally the ore deposits are of greater size and value where other veins or branches intersect the main vein. Rich pockets are often found where breaks or depressions in the strata occur.

Character of Ore

The mineralized rock is often identical with the country rock on either side. Quartz seems to be the main indication of gold, but this does not always hold, for places are known where silica abounds but the metal fails. Ribbon quartz generally carries persistent and rich gold ore.

The gold is often in a very finely divided state. It is found sprinkled about in the gangue and a large part of it appears to be locked up mechanically in the pyrites. It varies in fineness between 750 and 900, the remaining units consisting of lead, silver and copper. The gold as a rule carries little silver.

Tungsten is known in several properties and occurs in considerable quantities in the Golden Chest mine, which produced 15 tons of scheelite in 1907, the ore assaying from 61 to 77 per cent. WO_3. At the Golden Winnie tungsten is also found, generally as a concentrating ore, with occasional pieces the size of an apple. Several tons of concentrating ore are now on the dump at this mine. Scheelite was frequently found in the sluice boxes while placer operations were carried on in Trail and Pony gulches. In Eagle gulch Dunlap & Smith find scheelite in their boxes, and one small vein has been uncovered near the Columbus group.

Lead-Silver

The lead-silver ores generally lie in

northwest fissures, cutting across the country formation. They occur as plain fissure fillings and as metasomatic deposits. A distinctive feature of the Coeur d'Alene lead deposits is the association of quartzite with the ore, all the great orebodies found occurring in quartzite formation.

Although networks of quartz veinlets often penetrate the lead ore, the veins do not carry any great amount of quartz. Lead ore occurs in shoots similar to those carrying gold. The lead shoots often increase in width and length as depth is attained.

Cerussite, anglesite and pyromorphite occur in the oxidized zone as alteration products of galena. The carbonates are richer in silver than the sulphides. Iron carbonates are common in the upper zones of the gold veins, as well as in those of the lead deposits.

unaltered, the ore diminishes in quantity and quality until it gradually fades away into the country rock.

Deposits of Gold Ore

The gold ores were formed subsequent to disturbances which rendered the rocks schistose. Some gold-bearing fissure veins are known but the gold deposits occur mostly as bed veins. The mineral contents of these bedded veins appear to have been introduced by fissures and are not due to surficial sedimentary deposition, as is generally supposed. The form of these gold veins is probably due to a large extent to the softness and solubility of the rocks in which they occur. There is a series of such bed veins exhibiting remarkable continuity, and extending over rather a wide stretch of country, but possessing the same characteristics wherever exposed. They are

these ascended from the earth's interior the silica and sulphides were deposited by reduction of pressure and temperature as well as by chemical reaction. In some instances metasomatic interchange has taken place, and the vein matter and country rock cannot be differentiated. Gold frequently occurs with mispickel and is sometimes associated with antimony, apparently in some mineralogical combination. The outcrops of the gold veins are generally stained brown from decomposed pyrites and often have a cellular structure.

Ores of Other Metals

The majority of the lead-silver deposits in quartzite are metasomatic fissures. Mineral-bearing solutions circulated through these fissures, altering their walls and impregnating the adjacent crushed quartzite with iron, lead and zinc com-

KLONDIKE VEIN, 3½ FT. WIDE, DARK PORTION IS PURE SCHEELITE

THIRTY FEET OF THE KLONDIKE VEIN, SHOWS RIBBON STRUCTURE

The fault-plane fissures generally carry a gouge. In the quartzite formation the predominating class of fissures are those having but one principal plane of fissuring, although fissures with two planes are not infrequent. The fissures possess a width varying from that of a knife edge to hundreds of feet, and those carrying lead-silver ores generally have a dip greater than 40 deg. They are usually accompanied by a gouge, and one or both of the walls may be slickenslided.

The preëxistence of an open space, however slight, to give passage to the ore-bearing solutions, was the essential factor for the formation of orebodies. The greater the shattered area adjoining the fissures the greater was the area of contact afforded the mineralized solutions, and the greater the ore deposition. Where the fissure grows smaller and the country rock becomes harder and more

found in a belt about five miles wide by ten miles long, and embrace the following properties: Gold Dust, Golden Chest and Mother Lode group, Buckeye Boy, King, Winnie, Crown Point, Fanny, Wake-up-Jim, Fay Templeton, Mammoth and Evolution. Although dissected and altered by folding, faulting and erosion, there is little doubt that at one time they constituted a series of continuous veins covering a large territory.

These veins occur wholly in the Prichard slate formation, this formation varying from shales to silicious slates and containing occasional inter-bedded ribs of quartzite. In many places the shales have undergone extensive pyritization, and where the slates have been shattered silicification has generally resulted.

The mineralizing solutions of the gold deposits were probably deep-seated, hot, carbonated and alkaline waters laden with silica and metallic sulphides. As

pounds. In some cases the iron compounds were subsequently metasomatically replaced by lead and zinc sulphides. Where zinc is plentiful magnetite frequently occurs.

Crystals of galena are unusual, the mineral being generally of a fine-grained texture, which would indicate substitution for fine-grained quartzite. The galena is often slickenslided and frequently contains pieces of quartzite, iron pyrites and iron carbonate. The orebodies are generally very irregular and the gradual gradation of ore into country rock indicates that the ore was not deposited in preëxisting open spaces. In slate formation the lead deposits generally have a hanging and a footwall, but the shoots are very irregular and usually of no great size.

The copper deposits have been but slightly developed. The general form of deposit appears to be an impregnation of

quartzite with sulphides and carbonates of copper.

The Golden Chest Property

The Golden Chest series and the Mother Lode veins have been the heaviest gold producers, but numerous other lodes have contributed considerable amounts.

MURRAY, IDAHO

The Golden Chest group lies about a mile due east of Murray and embraces 46 claims, mostly patented, in the heart of the Murray gold belt. These claims cover Idaho hill, Chest hill and a large portion of Reeder hill. They are operated by the United Golden Chest Mining and Milling Company, a consolidation of the Golden Chest Company, Katie & Dora Company, Paymaster Company, Butte Creek Placer Company and various smaller interests.

The Chest hill stands at the head of Reeder gulch slightly less than a half mile above the stamp mill and attains a maximum elevation of about 4500 ft. The earliest workings of the property are located upon this hill which has been honeycombed with many miles of tunnels, crosscuts, stopes and shafts. The hill is composed of shales, graywackes, slates and quartzites with intermediate varieties of these, the slates predominating.

A series of important gold-bearing veins are found in this hill, and these conform approximately in strike and dip with the inclosing country rock. The veins possess a general strike of north 15 deg. west and dip to the west at angles varying from 30 to 60 degrees.

The uppermost of the series is the Gold Brick vein, which ranges from 6 in. to 5 ft. in width. About 150 ft. beneath is the Clagett vein, varying from 2 to 6 ft. in thickness. About 25 ft. below the Clagett is the Hanging Wall vein, which carries from 3 in. to 12 ft. of ore. Below the Hanging Wall vein and separated from it by 30 feet of stratified gold-bearing slate, is the Footwall vein possessing a width of 3 in. to 3 ft. From this vein some very rich ore has been taken.

The Hanging and Footwall veins are locally known as the Katie and the Dora. The slate filling between these veins is seamed with quartz threads and stringers, and in many places is badly fractured and twisted. Besides the veins mentioned, several are known to exist in the upper portion of the hill, but as yet they have not been explored.

GOLDEN CHEST MILL

Nature of the Deposits

The veins consist of quartz and slate carrying free gold, tellurides, tetrahedrite, pyrite, mispickel, chalcopyrite, galena, sphalerite, and scheelite, the latter mineral occurring in commercial quantities, a large tonnage being now exposed.

Some of the richest lodes consist of ribbon quartz, in which the ore occurs between the layers of slate and quartz. The ore is found along the foot or hanging wall, often extending from wall to wall and at times scattered in bunches throughout the vein.

The veins from time to time widen out into ore shoots of considerable magnitude. One of the most extensive of these bodies is in the Klondike fissure on the Katie and Dora veins, and from it large quantities of high-grade ore have been extracted. The Klondike is in many ways an exceptional orebody, and has produced several fortunes. It is the largest and one of the richest gold shoots in the entire region.

A short distance within the Idaho tunnel is a large shoot of high-grade ore, called the Jumbo, 30 ft. wide, which continues for 150 ft. when it is cut off by a fault. A few feet beyond this fault a large fissure vein known as the Idaho or Paymaster vein is encountered and the

tunnel follows this for more than 800 ft., continuing in ore practically all the way. This vein has an average dip of 40 deg. and follows the general lay of the country formation. The footwall consists of very hard quartzite and the hanging wall is slate. Next to the hanging wall is a clay gouge, in places 1½ ft. thick and averaging 6 in. A number of tunnels and shafts penetrate this vein at various points along the hillside, exposing an enormous tonnage of low-grade ore, with occasional shoots of high-grade material.

The north slope of Ophir mountain rises abruptly to a hight of 1500 ft. above the waters of Prichard creek, and in this mountain, directly across the creek from the Golden Chest, is the Mother Lode series. The formation here is almost flat and the strata consist of thin layers of quartzites and silicious slates with occasional interbedded quartz veins. The Mother Lode series comprises two veins conforming to the general country formation and separated from each other by a vertical distance of about 250 ft. These two veins are known as the Upper and Lower, or as the Treasure Box and Mother Lode veins. Their general strike is northeast and they dip to the northwest at an angle varying from horizontal to 20 deg. The ore is generally in irregular shoots, raking to the west. The pay vein ranges between 2 and 6 in. in width. The veins are without doubt a continuation of those encountered in the Chest ground.

The Treasure Box, Mother Lode, Occident, Daddy and Yosemite companies operated on these veins for many years and extracted more than $500,000. They proved low-grade as a whole but contained occasional pockets of extremely rich ore, much of it free gold. The veins were drifted upon for several hundred feet, and flat stoping was employed. As the veins were followed into the hill the ore became too base for the stamp mills to handle, and the mines were closed.

Prichard Valley

From Littlefield to Reeder gulch a great deal of placer gold has been found in Prichard valley, especially along the north rim. The main valley paid well from Wesp gulch to Gold Run. Opposite Dream gulch and about one mile below Murray is the "Pit," owned by the Cœur d'Alene Placer Company. The north rim at this place yielded considerable gold. The pit is, as the name indicates, a great water-filled excavation in the gravels of Prichard creek.

These gravels are hydraulicked, then run through riffle boxes and finally stacked by means of a 10-in. hydraulic elevator, the power for which is furnished by a 22-in. pipe line, about 22,000 ft. long, bringing water from the vicinity of Raven, and delivering it under a head of about 90 lbs. per sq. in. at the pit. The gravel here is from 18 to 30 ft. deep, and contains a great number of large boulders.

The gold is found in the immediate vicinity of the bed rock, or lying directly upon it. The top gravel is practically without value. No reliable data are available, but the gravel at the pit probably runs in the neighborhood of 50c. per cu. yd., and under present conditions, it should cost from 40 to 50c. to move a cubic yard of gravel.

Bear Top Lead-Silver Mine

The Bear Top vein outcrops on the north slope of Bear Top mountain about 1200 ft. above Bear Gulch. The croppings show a mass of white fractured quartzite about 20 ft. wide with frequent stringers, and bunches of galena and carbonates throughout its entire width. The vein varies in strike from east-west to north 60 deg. west and dips from 45 to 70 deg. to the south.

The vein was drifted upon to east and west, and an ore shoot was discovered to the west of the main ore shoot as well as one to the east of it. The main ore shoot was found to be 70 ft. long and varied from 4 to 35 ft. wide. A raise was made from this level to the surface and continued in ore throughout its length. Over 1500 tons of high-grade lead ore carrying silver, gold and copper were shipped from this stope. The west shoot is about 40 ft. long, and carries from 3 to 6 ft. of concentrating ore. The east shoot is about 40 ft. long and contains from 3 in. to 3 ft. of steel galena of shipping grade.

Manager Kiebler is now running a 1500-ft. crosscut to tap the ledge about 500 ft. below the present workings, and according to late reports has encountered 4 ft. of galena carrying silver, gold and a little copper.

The Bear Top vein is a metasomatic fissure, the hanging wall being well defined and slickenslided, while the footwall is generally indiscernible. Two faults are known, but the throw in neither case exceeds 30 ft. The Bear Top has the best lead-silver showing on the north side. The company owns a concentrator of 75 tons daily capacity and the property is well equipped with steam and water power besides a compressor and sawmill.

The British vice-consul at Santo Domingo reports that the Anibaje springs, east of Santiago de los Caballeros, Dominican Republic, contain sulphur and iron. In the western section of the Republic there are numerous sulphur springs, and in the Yayas de Viajama a sulphur mine has been reported. In the same district there are various thermal springs strongly impregnated with sulphur.

International Nickel Company

This company controls the nickel business in the United States and a large part of the foreign business also, holding the stocks of a number of constituent companies in this country, Canada and Europe. Its report is for the year ended March 31, 1908.

The bonded debt at the close of the year was $10,390,837, of which a total of $747,000 was held by the sinking fund, and a further $292,000 was held in the treasury for future sinking-fund requirements. The capital stock was $17,735,288, of which $8,822,662 is common and $8,912,666 preferred. The current liabilities were $2,590,083, and the current assets $4,433,592. There was $2,216,799 in the surplus funds.

The income statement for the year, condensed, is as follows:

Net earnings constituent companies in America	$2,434,952
General expenses, taxes, etc.	$149,583
Depreciation of plants	215,975
Mineral exhaustion	94,352
Bond sinking fund	168,250
Interest on bonds	482,050
Total charges	$1,110,210
Net profit for the year	$1,324,742

From the net profits dividends of 6 per cent. on the preferred stock were paid, amounting to $534,733, leaving a balance of $790,009, added to surplus.

During the year the sum of $1,548,482 was expended for new construction, equipment and replacements. There was appropriated from the surplus for further depreciation of properties $300,000. All buildings that are not of fireproof construction are fully covered by insurance. In addition to the above, a fund is being accumulated which, at the end of a short time, will be sufficient to enable the company to dispense with purchase of outside insurance.

President A. Monell's report says: "During the past fiscal year the power plant at the falls of the Spanish river, in the Province of Ontario, Canada, has continued in successful operation. The installation of electric mine hoists and compressors referred to in our last report has been completed, and the machinery is now in operation. The third unit at the power plant, also referred to, is now in course of erection.

"The board of directors has deemed it advisable to appropriate from the surplus a further sum of $300,000 to write down the cost of the properties. Our efforts during the past year to introduce nickel into new commercial arts have been vigorously continued. As the business conditions of the past year, especially the latter part thereof, are so well known, it is hardly necessary to state that our own business felt the general depression."

The Mines of Northwestern Altar, Sonora, Mexico

By George W. Maynard*

The early development of that part of the Altar district bounded by Arizona on the north and the Gulf of California on the west was confined to the wet-and-dry washing of the gold-bearing surface outcrops of quartz veins. There are no reliable records of the output, but that the work extended over an extensive area is evident from the pits, trenches and tailing heaps.

The principal workings were contiguous to El Plomo, a small village which took its name from the early discovery of lead ore on the property denounced as Abundancia, subsequent development fully justifying the name. The situation of El Plomo is shown on the general map of the district. It is about 40 miles south of the United States boundary and about 65 miles from the Gulf of California.

There are two ways of reaching El Plomo, one from Santa Ana on the Sonora railway, which extends from Nogales on the United States boundary to Guaymas on the Gulf and thence by road via the town of Altar 125 miles, and the other, and better, route from Tucson via Sasabe on the boundary, where there is a subcustom house, 123 miles. The distance is easily covered in 10 hours by automobile.

Climate

The altitude is only 1200 ft. Notwithstanding the low altitude the midsummer temperature is not oppressive for the reason that a cooling breeze comes up from the west every afternoon. The winter climate is delightful. Malarial fevers, and other diseases incident to semi-tropical countries, are unknown. During the summer the foliage is always green because of the unfailing water within 30 to 40 ft. of the surface as has been proved by the sinking of numerous wells for domestic and milling purposes.

Mining Development

The first systematic development in the district was carried on by the National Mexican Mining and Development Company from 1896 to 1898. The work was confined to the Leones and Ruizena groups six miles from El Plomo, and other outlying mines. On the formation of the Illinois Development Company in 1905 the holdings of the National Mexican company were taken over together with the Abundancia mines.

The quartz outcroppings of the Abundancia lode are in a prairie country and practically continuous for more than half a mile. At several points the outcrops indicate the existence of three or more veins within a width of 150 ft. The general strike is north and south and the dip westerly. The surface dimensions of the group are on the strike 4920 ft. with an average width of 1748 feet.

The geology has not been worked out in detail, but the country is in the main rhyolite, sometimes showing fine grained felsite, then again crystals of feldspar (felsite porphyry) and frequently both quartz and feldspar (quartz porphyry). The surface outcrops show the carbonates and sulphates of lead with a peculiar brownish incrustation or varnish of hematite. Barite is also found in the outcrops. The country rock adjoining the outcrop has become kaolinized; in fact, kaolinization has in many places extended as far as the veins have been opened in depth.

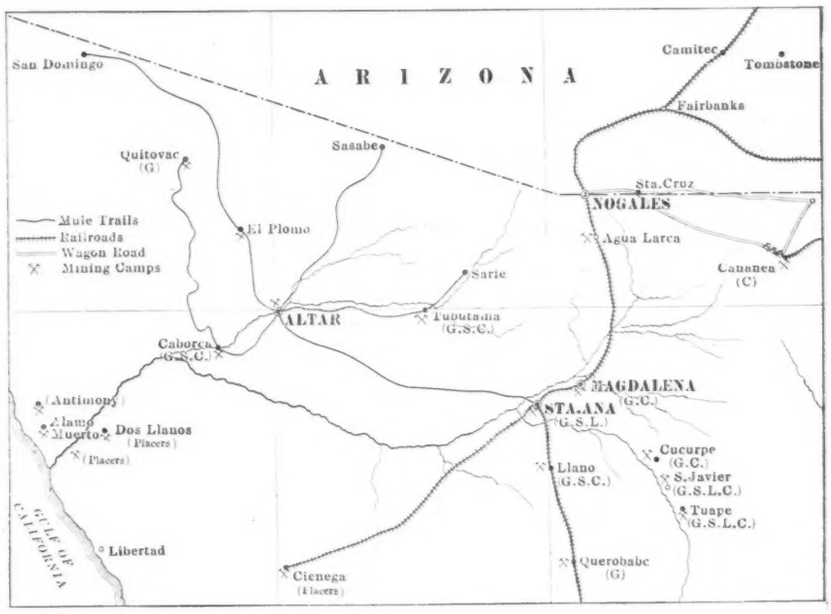
La Abundancia Mine

At the time of the purchase of the property by the present owners, the workings had been confined to the sinking of a vertical shaft near the north end of the claim to a depth of 75 ft. From the bottom of the shaft a level was driven north, 120 ft. and south 100 ft. between well defined walls and in ore for the entire distance. Sixty feet north of the shaft a winze was sunk 28 ft. in ore. For 120 ft. in length the ground was stoped nearly to the surface leaving, however, some blocks of high-grade ore. Drifting at the north end now amounts to 500 ft. with no variation in the character of the vein. Farther sinking could not be carried on account of water. The extreme development in depth at this point is but 103 ft. The ore thus far developed in the north end of the lode is cerussite (lead carbonate) and anglesite (lead sulphate), the latter predominating. Without exception these minerals carry relatively high silver and gold contents down to the lowest workings. The final sampling of the north ground showed a width of vein in places as high as 6 to 7 ft. The average, however, of 59 samples was 2.5 ft. and the total average value in lead, silver and gold $21.54 per ton.

During the progress of development daily samples were taken of the entire exposure for a period of six months. The average of the entire sampling for six months was: Lead, 23.43 per cent.; silver, $4; gold, $3.55. The mode of occurrence of the gold in the oxidized lead ore has not yet been determined. At the bottom of the winze the first small bunch of galena was found, the forerunner of the unoxidized ore in depth.

The south workings on the lode consist of a 335-ft. drift at 100 ft. north of a shaft 176 ft. deep, and cross-cuts which have shown the existence of parallel veins. In addition to the lead ore bunches of chalcopyrite are frequently found and in places there are evidences of the persistence of copper sulphides in depth.

On an average the grade of the ore at the south end is not as high as at the north, but where copper comes in it is higher. Some of the samples contained 6 to 8 per cent. copper. Where copper occurred, as a rule there was no lead. The 100-ft. level has been extended 211 ft. north of the shaft and lacks but 300 ft. of connecting with the level which has been driven south 210 ft. from the north workings. It has not, however, been absolutely determined that the two levels are on the same vein. The extreme north and south development are 1160 ft. apart, of which 860 ft. have been opened up, leaving but 300 ft. to be driven to prove absolutely the continuity of the lode.



MAP OF A PORTION OF SONORA

*Consulting mining engineer, 20 Nassau street, New York.

The Leones and Ruizena Groups

These are six miles south of El Plomo on the east and west slopes of Ruizena mountain. The road is practically level to the foot of the mountain. The mountain mass is granite. Professor Guild, of the University of Arizona, has identified the basis dikes as camptonite, a rock consisting of crystals of hornblende in a ground mass of plaglioclase feldspar. The composition is the same as diorite, and in the field these dikes are usually called "diorite dikes." The term "camptonite"[1] refers mostly to the structure which cannot be made out without the microscope. The granite has been weathered more or less on the surface and immediately adjoining the veins in depth. The veins, which, as a rule, are well defined and readily traced on the surface, bisect the formation at angles ranging from 20 to 35 deg. from the vertical. The general definition of the veins is strongly marked, and they are readily followed. The vein mass or filling is made up of quartz and kaolinized country rock. The hydration and consequent displacement of the rocks which inclose the vein cause slips and local faultings which throw the vein, but a careful study of these phenomena has made it possible to catch the vein when faulted.

The metamorphism adjoining the veins has been more extensive and complete on the west side of the mountain than on the east, and as a result the veins are more easily followed and the mining is less costly. On the east side the ore lacks the continuity which characterizes that on the west, and where it does occur it adheres to the vein filling, which is largely quartz, so that the cost of mining is much greater than on the west side.

As the east side mineralization differs so widely from that on the west, it will probably be found that the veins do not coincide when the west side levels are driven through the mountain.

To P. W. K. Robertson, of Parral, is due the rapid development of the Abundancia mine under very adverse labor conditions.

Leones Group on West Side of the Mountain

This group covers 4845 ft. on the strike of the veins already determined and a width of 656 ft. from the foot of the mountain to the summit. The development has been carried on through five adit levels. The two lower levels have not been driven far enough to cut the vein, but the three upper levels are in ore for 375 ft. on the strike. The levels are connected by winzes to a depth of 330 ft. The east ends of the levels are in ore, so the extent of the vein is still to be determined.

For the purpose of arriving at the value of the ore already opened up, the exposures were broken down as they would be for shipment to the mill. The total amount was 39,952 lb. Each lot was passed through a Comet crusher and then into Cornish rolls set to 5/16 in. The mixing and quartering for assay was carried out in the usual manner. The average assay value of the entire sampling was $9.77, and the average width of the workable veins 2 feet.

By pan amalgamation 59 to 72 per cent. of the gold contents was extracted. The tails from the amalgamation were concentrated and contained 0.90 to 9.20 oz. of gold.

In the lowest workings iron pyrite begins to come in and a little water.

Ruizena Group

This group is on the eastern slope of the mountain and nearly in line with the Leones. The length on the assumed strike is 2191 ft. and 984 ft. in width. The veins occur in granite, but unlike the western slope the weathering has been very limited, and the definition of the vein is not as marked as in the Leones, and as the ore is distributed through the gangue and adheres more closely to it, close cobbing or dressing is necessary. The ore is for the most part galena and iron sulphurets.

The development consists of an adit of 680 ft., and slopes from 60 to 100 ft. and some inacessible workings below the adit level. There are no records of the tonnage mined and sent to the dressing plant at El Plomo, so that the number of tons which went into the dressed ore is an unknown quantity. The only reason for giving the mine any consideration is that the returns from the Pueblo and El Paso smelting works from 286 tons of concentrates and 150 tons of hand-sorted ore, making a total of 436 tons, gave a net yield after the payment of freight and smelting charges, of $60,663.72. The concentrates are said to have averaged $150 per ton.

Prospects of the District

The foundation of successful mining in the El Plomo district will rest primarily on the development of the Abundancia group, and the work thus far done amply justifies vigorous exploration. Remoteness from transportation and traveled routes is the only explanation of the ignorance of the district.

Intelligent exploratory work on the lines already inaugurated for, say, 18 months, should put enough ore into measurable reserves on the Abundancia, to warrant the next step, viz, the building of a railway from Port Libertad on the Gulf of California to El Plomo and to extend eventually to Tucson. The reasons for an independent road to the gulf are manifold. Primarily, to the bringing in of supplies for the establishment of a large mining and smelting works, subsequently the supply of coke and the shipment of matte and base bullion to the Pacific terminus of the Tehuantepec railway and over that road to the Atlantic terminus when European smelting works could be reached. The Tehuantepec road is now offering very favorable rates. At both ends of the road the most approved machinery for handling heavy freight is now being installed. At the present time coke is being laid down at Santa Rosalia on the Gulf, the port of the Compagnie du Boleo, a French company, at $8 per long ton. On the completion of the Panama canal the cost will be materially reduced.

Port Libertad is the best port on the coast north of Guaymas; it is sheltered by high bluffs from the northwest winds and has deep water up to the shore line.

Apart from the development referred to in this paper, important discoveries of copper ores just south of the Arizona line have been made at Cobota and also at Caborca, south of El Plomo.

The drawback to development of the district has been the lack of reduction works and transportation facilities. When these are established this corner of Sonora will be controlled by those who have the capital and patience to tackle the problem on the lines indicated.

[1]Camptonite was named by Rosenbusch because the sample of rock sent to him was found at Campton in the Pemigewassett valley, New Hampshire.

Nickel-Copper-Platinum Ore in Nevada

By A. Maurice Thompson*

A deposit of ore similar in many respects to that at Sudbury, Ontario, has been the object of considerable investigation and development in southeast Nevada. It is situated at the west end of the Virgin River mountains, about five miles west of the Nevada-Utah boundary. The district is reached from Moapa, on the San Pedro, Los Angeles & Salt Lake railroad, by a 35-mile stage ride, passing through Bunkerville.

The country consists of mica schists and limestones, into which lenses of diabase have been injected. The lenses range from 10 to 50 ft. thick, and from 50 to 600 ft. long, and have a northeast-southwest strike.

At one locality, about 5000 ft. of development work has been done, reaching a maximum depth of 400 ft., and blocking out 150,000 tons of ore. An average of 25 samples taken throughout this development shows copper, 3 to 5 per cent.; nickel, 2.5 per cent.; and platinum, 0.3 oz. per ton. Certain specimens have been reported to carry as much as 12 per cent. nickel.

Deposits of this nature are of wide extent in the district, and, were it not for the distance from nickel-refining centers, a large output of ore could easily be made. The platinum seems to be uniformly distributed throughout, as every sample shows a yield of this metal.

*Bunkerville, Nev.

Ore Contracts from the Smelter's Standpoint

Smelting Involves a Great Many Varying Items of Cost Which Can Not Be Fairly Apportioned under a Flat Rate

BY CLARENCE A. GRABILL*

The article by H. M. Adkinson on ore contracts in the JOURNAL of May 16 has attracted my attention, owing more, perhaps, to its representing a very common belief that the average smelter manager is in business merely to make all he can out of each individual lot, than to its correctness. In fact its many discrepancies and incorrect conclusions lead me to a desire to show: (1) that his method of comparison was wrong and necessarily leads to uncertain, if not incorrect, conclusions; and (2) that the reasons for the so-called peculiar methods of calculation are based on justice and sound reasoning, and are intended to be as far as possible equitable to both sides and that the flat rates so much desired by Mr. Akdinson and everyone else would involve uncertainty and unfairness, and are consequently not used except in special cases.

I do not mean to say that competition is not advisable. Far from it. But I do consider that with the exception of his last two contracts the differences were not so much due to the contract as to the peculiar phases developed by changes in prices or grade or composition of the ore.

I will state in passing that I have been in the past connected with a customs smelter and expect to be in the future, although not now actively so.

VARIABLES AND DIAGRAMS

To take up the first part of my thesis, I wish to call attention to the fact that Mr. Akdinson's tables contain, or are affected by eight independent variables, i.e., the prices of lead and silver and the percentages of lead, silver, gold, insoluble, iron and sulphur, besides the dependent variables.

Now it is impossible for human ingenuity to construct a diagram to represent so many changes and will be until the mind can comprehend multidimension space. Consequently the tables merely represent phases of the changes, isolated points as it were; and the peculiar results are frequently due to some overlooked variation other than the contract to which they are ascribed. The best we can do is to limit our variables to quantities whose variation we can observe, say two or three, taking planes in space rather than points.

I have, therefore, made certain assumptions derived from Mr. Adkinson's figures and data which, although not adhering closely to any one case, are approximately true of all. Unfortunately his data do not always agree with his tables as will hereafter appear.

I have assumed that for every unit of lead there were in the ores 0.005 oz. gold and 0.4 oz. silver, and that, beginning with an ore running 45 per cent. lead and 14 per cent. Fe the iron increased one per cent. for every decrease of 2 per cent. lead; that the insoluble was constant at 8 per cent.; and that all assays were fire assays. In Fig. 1 I have plotted the value from the ores of different grade under the different contracts assuming a constant market price for lead and silver of 4c. per lb. and 60c. per oz., respectively. In Fig. 2 I have plotted two ores running 22 and 42 per cent. lead respectively, with a varying price for lead as shown by the abscissas, the ordinates showing the value received by the miner as in the previous case.

The curves are numbered to correspond with Mr. Adkinson's tables, curve 1 representing the results under the contract or arrangement shown in his table No. 1. Two curves are given for his third contract, marked 5 and 5*a* respectively, the former being the terms as he states them, and the second or lower, the terms as they actually were as shown by his figures in Table 5. Before continuing I wish to note that although his assays run from 21 to 45 per cent. lead the actual averages hung pretty closely to 30 per cent. lead as shown by his tables except under Table No. 5.

MEANING OF THE CASE STATED

From these figures we may conclude

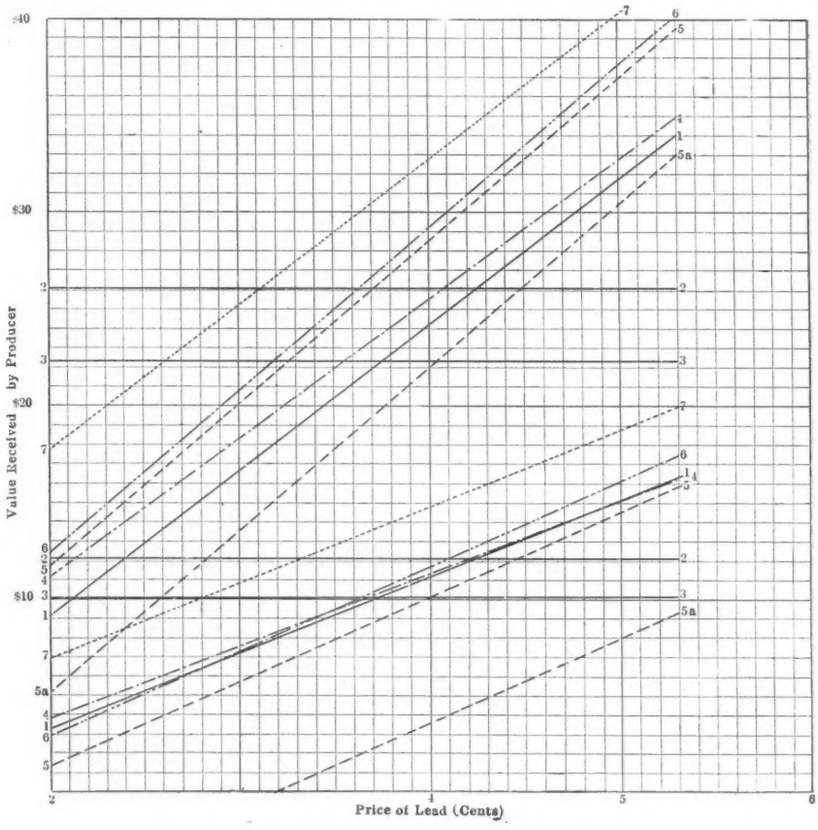


FIG. 1. CURVES SHOW RETURNS TO PRODUCER FROM ORES OF DIFFERENT GRADES SOLD UNDER DIFFERENT CONTRACTS

that matters happened about as follows (for convenience let us call the miner or his company *B* and the smelters *X*, *Y* and *Z*):

Miner *B*, having from time to time small shipments of ore naturally took them to the nearest smelter and there disposed of them at a tariff, curve 1, intended for small or irregular shipments, necessarily higher than for a regular or large shipper. Such a rate is usually made more favorable for low-grade ores; and for such it compares favorably with

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most of the others, particularly under the circumstances. It was intended to encourage the shipper of low-grade ores, but bears rather hard on the high-grade man who can presumably better afford it. This is, broadly speaking, a general principle; but it must be borne in mind that small irregular shipments are more expensive to handle than large regular ones.

Finding that his shipments were regular *B* obtains a contract, curve 2, which was the best arrangement for very low-grade ores with lead at 4c. that he ever received, and for his average ore was better than any except the last two, and but little different from one of them. Yet, Mr. Adkinson calmly informs us that it was not so advantageous as No. 1.

The trouble appears to be that as a flat price was paid for lead, the smelter received all the advantage of a rise and suffered all the loss due to a fall. In the case given the price rose to 4.32c., at which price the terms of No. 2 are surpassed by his first open rate and the second and last two contracts. Had the price fallen he would have had a different story to tell.

Contracts of this type are very unsatisfactory to the purchaser, but are often made at the solicitation of the miner who, "wants to know what he is going to receive for his ore." I am not revealing a professional secret when I add that they are not often or intentionally made on a falling market. They are best avoided. Roulette or faro offers a surer method for one who is looking for financial difficulties on a small scale.

Contract of Another Type

At the expiration of this contract, I regret to say, there appears to have been a little jockeying and curve 3 represents the smelter's move. This was obviously unsatisfactory to everyone concerned except Mr. Adkinson, who calls it the best so far. Reference to Fig. 1 shows that with lead at 4c., the miner received less than any arrangement except that represented in curve 5. Reference to Fig. 2 shows that this statement holds for high- and low-grade ores at all prices of lead above four cents.

At the close of this period contract No. 2, curve 4 was agreed upon, which with lead at 4c. is not so good as his first contract, though at all prices above 4.2c. it is better (Fig. 2). It is an arrangement similar to No. 1, but better by about $1.50 per ton in most cases. I regret to see that Mr. Adkinson says it is "the least favorable so far," for it is better than No. 1 in all similar cases with lead below 5c. and better than No. 3 in all probable cases and better than No. 2 in most probable cases on ore of similar grade and composition at the same market price for metals.

Under a contract giving a fixed price of lead, as in Nos. 2 and 3, the miner's percentage rises as the market price falls; but under a contract with a fixed deduction from the market price the miner's percentage increases with a rise in price. This difference should be constantly borne in mind, both in examining the tables and in practice when the price is varying according to its usual custom.

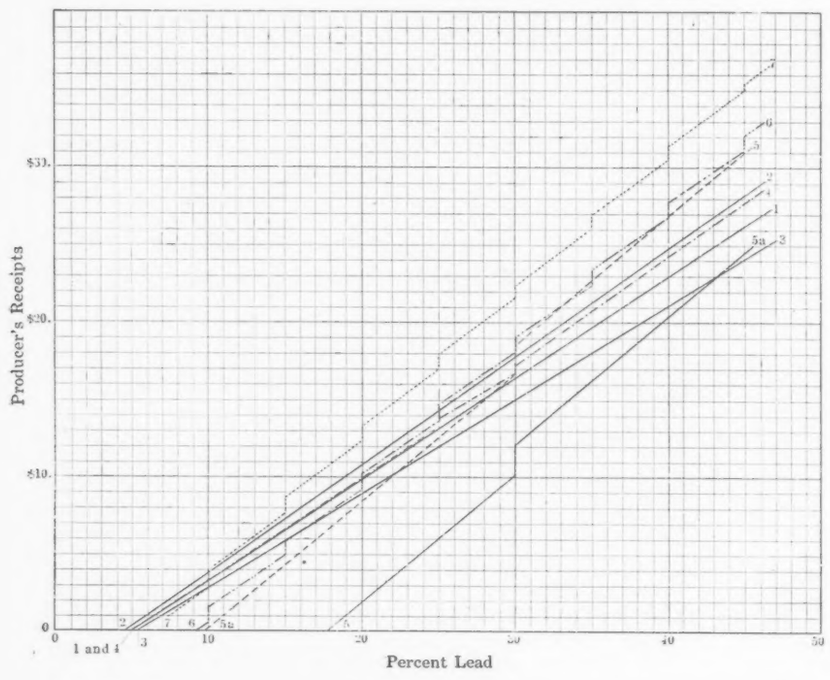


FIG. 2. VALUE TO PRODUCER OF A 42-PER CENT. LEAD ORE UNDER MR. ADKINSON'S CONTRACTS WITH A VARYING PRICE OF LEAD; GOLD 0.21 OZ.; SILVER 16.8 OZ. PER TON. FIG. 3 COVERS THE SAME CONDITIONS EXCEPT THAT THE ORE CONTAINS 22 PER CENT. LEAD

At this point *B* appears to have tried a bluff, or else to have lost his head, for he makes a new deal which he apparently does not understand. At the best the data given with the table are incorrect. This contract was especially unfavorable to low-grade ores, a 17-per cent. ore yielding nothing under its terms.

An Examination of Mr. Adkinson's Figures

Mr. Adkinson states that the miner received a bigger percentage than under the former contracts. He would have received a bigger percentage still under any of the other contracts on ore of the same grade and at the same price. He also states that the smelter paid the freight. He is doubtless correct, but equally doubtless it was charged up against *B* in the account in spite of the, "increase in favor of the miner."

For convenience I give his tables omitting the percentages in the last column.

ADKINSON'S TABLE NO. 5.

New York Values.

Gold at $20.67	$566.56
Silver at market	769.93
Lead at market	2,811.50
Total value of product	$4,147.99
Total marketing expense	$211.44
Net proceeds	1,957.67
Producer's portion	$2,169.11
Treatment	$476.27
Freight at $6.50	526.27
"?"	976.34
Smelter's portion	$1,978.88
Total	$4,147.99

The terms of this contract as indicated by Mr. Adkinson are: Gold, at $19 per oz.; silver 95 per cent. at New York market price; lead, full contents at 45c. per unit, this price based on a lead quotation of $3.75 per cwt.; for each 5c. increase or decrease add or deduct 1c. per unit to or from the above price; treatment: $6 per ton over 30 per cent. Pb and $8 per ton under the same.

Examination of this shows that the lead is paid for at the New York market price less 1.5c. Proceeding to our calculations on the above basis we find that the gold at $20.67 equivalent to $566.56 is equal to $520.79 at $19 per oz.; 95 per cent. of the silver value is $731.43, giving a combined credit of $1252.22. Deducting this from the "producer's portion" we have a credit balance of $916.89, evidently due to the lead, to which must be added the treatment charge $476.27, giving us a total credit of $1393.16 on the assumption that the smelter paid the freight out of its deductions. Deducting this $1393.16 from the lead value $2811.50, we have a smelter's portion of the lead $1418.34. This we have seen is equivalent to 1½c. per lb.; hence the $1393.16 must represent 1.47c. per lb., giving a total New York market price of 2.97c. per lb., which is contrary to the data given and also absurd.

If, however, we assume that the freight, though paid by the smelter, was charged

against the shipper's credit, we must add that amount $526,27 to the lead credit previously obtained, giving a total of $1919.43 credit from the lead. Deducting this from the $2811.50 we obtain a smelters portion of $892.07 to represent the 1½c. deduction from which we calculate that the New York market price was 4.73c. per lb. which corresponds with the balance of the figures and is, therefore, probably correct, though the data given call it 4.05 cents.

The Ore Under Earlier Contracts

If we take the terms given under the previous contract and assume the insoluble and iron as accompanying the table we may calculate the yield for this ore under the second contract. The result is rather startling and is as follows:

Gold	$520.79
Silver	731.43
Lead	1,601.39
Total	$2,853.61
Treatment	456.31
Producer's portion	$2,397.30
Producer's portion	57.9 per cent.

From which we see that the contract called by Mr. Adkinson "least favorable" when applied to the ore sold under this improved, made-to-order-contract actually yields a greater percentage to the miner. Evidently *B* recognized the necessity of raising the grade under this contract and, as it was by all odds the poorest of the lot, on its expiration he hastens to *Z* for a contract that was really an improvement for higher-grade ores and at high prices though nothing startling on medium or low-grade ores, being surpassed by others under some circumstances. The last contract was apparently drawn by a company needing lead; for its terms are especially favorable, though I have not examined its figures carefully from the smelter's standpoint.

Some Variables not Considered

I do not contend by any means that competition is inadvisable or even unnecessary, but I do contend that comparison by means of a table like that of Mr. Adkinson is inequitable and unfair to both parties, and leads, as it led him, to incorrect conclusions. It is impossible to state without knowing all the conditions, probability of change of price, grade of ore, composition and regularity of shipments, which contract would be the best. Some would be better with a rising, others with a falling market, some with increasing lead, others with decreasing. About the only general statement seems to be that the conclusions drawn were wrong and even that statement has its exceptions.

It is well to remember that as values increase, no matter from what cause, so does the miner's percentage (Fig 3) and also that as the proportion of the value in gold and silver rises compared with the value of lead, so does the miner's proportion, because he gets from 92 to 95 per cent. of the precious metal values and rarely above 75 per cent. of the base metal. Treatment charges are excepted in both cases.

The arrangement given in the tables fails entirely to allow for these variations under one and the same contract. I know of no simple method or short-cut for the so-called mysteries of smelter contract for those who do not know. Blind luck, and trust in the purchaser which is not often abused, employment of one who does know, or sufficient study to inform one's self of all the conditions involved are the only ways. The last of which simply means a little plain hard work and applies to the smelter man who does plenty of it himself on every contract involving new conditions or any considerable amount. In fact the amount done on some would very likely be a revelation to many shippers. Nor is there a desire to beat the small shipper as is often believed, for it is to

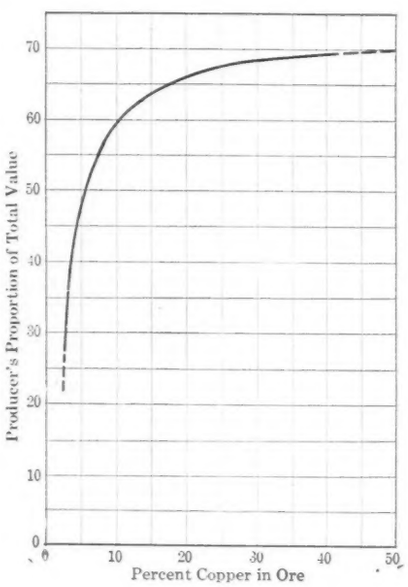


FIG. 3. PRODUCER'S PORTION WITH VARYING PERCENTAGE OF COPPER

their interest to encourage small shipments; but small shipments are expensive to handle and for that reason are frequently charged extra.

Principles Involved in Calculating Smelting Costs

In order to consider why the flat rate cannot be successfully given it will be necessary to examine roughly certain principles involved in smelting and, since I am more familiar with copper than lead, I will take up the matter from that standpoint. The principles apply equally to both cases.

Roughly costs, i.e., the cost of treatment of any metal containing rock by smelting and subsequent refining, may be and are divided into two large classes, each of which is in turn divided into two smaller classes, dependent on the nature of the material handled.

The two classes are *A* those dependent on and caused by the metal portion of the ore; *B* those dependent on and caused by the ore itself as a whole. Class *A* is divided into two classes (1) caused by the nature of and in proportion to the percentage of metal present; (2) fixed costs independent of the quantity. Similarly *B* is divided into those (1) dependent on the bulk of the ore, and (2) those dependent on its composition. These four classes of costs, independently variable, depend on entirely different causes and are the source of the complex (?) smelter tariff.

The smelter man usually keeps his costs by several methods, notably: per ton gross burden smelted; per ton charge proper; per ton net ore; per ton silica smelted (or in basic regions per ton FeO or CaO smelted); and per pound copper produced. He bases his charges on these figures and on the losses which may be included in the costs as above divided.

As an example of *A* (1) we have volatilization (not flue dust which is here not taken into account, it presumably being returned constantly) of gold, silver, lead and copper. In these cases a definite amount of blast will volatilize a definite amount of silver (or lead) under the same conditions as to surface and temperature; and, since surface, generally speaking, is dependent on the amount present so is the volatilization. An example of the fixed cost per pound or ounce is the refining charge. An example of the cost in proportion to the mass of the ore is the cost of handling; while *B* (2) is represented by the fluxes necessary due to the composition.

Smelting Losses

Silver recovery is usually taken at 95 per cent. This figure is more or less uncertain, and published data are admittedly unsatisfactory. The loss undoubtedly often is 10 per cent. and with especially well supplied plants may fall to 2 per cent. The low figures published are frequently due to neglected amounts in fluxes or ores low in silver, and where roasting has been adopted (because necessary), the loss probably runs nearer 10 per cent. The copper metallurgist usually treats a charge so low in silver that the errors in sampling and assaying obscure the result, and this is also true of gold and to a greater degree. Having recovered, say, 95 per cent. of the silver, allowing the slag loss as part of the 5 per cent., the smelter must still pay for the refining and sale of the silver so he actually pays more for it than he finally receives, compensating himself and finding his profits by other charges, while the miner promptly calls him a thief and a robber and a liar.

In the case of gold, which is more favorable, there is usually but little loss to the smelter by volatilization or in the slag, although that is appreciable. It is perhaps 2 per cent., but in some cases it may rise to 4 or 5 per cent. The determination

is rarely sufficiently well done to give exact figures, and errors of assay, sampling and neglected and undetermined quantities in fluxes, etc., usually mask the exact result. The loss in slag varies with the amount on the charge and the matte or lead fall, but the percentage loss undoubtedly decreases with increased amounts; hence the higher price paid for larger amounts. I am inclined to estimate actual gold losses at 5 per cent., although usually masked by the causes mentioned, so that they appear less.

Allowing four months for investment from time of sampling to finally returns and interest at 6 per cent. a year, we have an additional loss or expense of 2 per cent., and since $19 is about 92 per cent. of the actual value, this leaves 1 per cent. to pay for refining and coinage. These figures for interest apply to silver also. When $19.50 per oz. gold is paid we appear again to have a loss to be met by other charges. The miner frequently feels that he is being robbed if he does not get $20 an oz. for gold, and all his silver at market price, and will admit an increased smelting charge rather than decreased payments. Competition and this psychological fact have frequently resulted in peculiarly worded contracts.

I remember one case in which a contract was offered with the usual premium of 10c. a unit for iron and corresponding deduction for insoluble. The miner's view of the matter, as reported to the office, was, "The Lord Almighty put the silica in the ore and I won't pay for it." The ore was fairly uniform, and perhaps slightly higher in iron than the insoluble, so the contract was adjusted satisfactorily, I believe, by striking out the penalty for silica and the payment for iron.

Cost of Producing Copper

Turning to copper, the fixed costs for this metal are due to its converting and subsequent refining, and may be calculated on the actual weight of the copper, since they are almost wholly dependent on that. Converting may be taken at ¾c. per lb. shipment East as converter bars at ½c. per lb. Refining costs about ⅔c. per lb., but the smelters usually pay about ¾c. for that operation; sales commission and remelting cathodes to wire bars ¼c.; interest on investment for four months ¼c. Insurance may be included in the shipping charge.

We thus have expenses of 2½c. per lb. directly chargeable to the copper. It is this 2½c. that appears as a reduction of from 2½ to 3c. or more off the New York market price of electrolytic copper, depending upon whether the particular manager includes certain losses in this amount or not, and whether he figures profits here or elsewhere. I know of one contract that called for 6c. reduction from the market price on certain ores. The ores in question were low-grade silicious and required a large amount of flux involving an increased slag loss which was covered by that method using a sliding scale. This charge could not be covered by a flat rate if the grade of the ore changed, nor could it be covered by a percentage arrangement if the price changed. In the latter case let us suppose we deduct 20 per cent. from the copper or the price, the result being the same. Then with copper at 10c. the smelter would receive only 2c. per lb. to pay 2½c. If, however, the price rose to 25c. and the deduction of 20 per cent. were taken, then 5c. would be taken to pay 2½c., manifestly unjust both times.

Handling and Fluxing the Ore Mass

Taking up our class *B* of expense, we have the handling, sampling, feeding etc., due entirely to the ore mass, and on the other hand if the ore requires a flux it involves not only the cost of the flux but its handling, fuel to smelt it, increased slag loss due to its presence, increased volume of slag, perhaps decreased saving due to decreased matte fall, etc., all of which must be considered; it is obvious that these charges could not be covered by a figure dependent on the weight of the precious metal contents.

This cost accounts for the bonus paid for iron and penalty for silica. If we assume an extreme case, as of pure quartz with gold, the smelting charge in the Southwest today by regular open schedules would be $10 penalty for insoluble and $3 smelting charge, which is not unjust as will be seen later. I am excepting, of course, special cases such as the use of quartz ores for converter linings and similar cases. To make matters clear I shall take two cases of an extreme type and for simplicity will omit silver and gold values. I will assume that the ore and fluxes are pure, that no flue dust is made, or at least is resmelted as fast as made, and that the coke has no ash. The figures given will represent extreme cases and will, therefore, be exaggerated examples of actual variations occurring on a smaller scale.

Typical Cases

I will assume (1) a low-grade silicious ore carrying 6 per cent. copper, 92 per cent. silica and 1½ per cent. sulphur; (2) a high-grade silicious ore carrying 60 per cent. copper 15 per cent. sulphur and 25 per cent. silica. For costs I will take coke at $12 per ton, limestone at 50c., labor 50c. Power, repairs, supplies, taxes, general expense, management, superintendence, etc., at $1 per ton of ore and fluxes handled. Slag losses will be taken at 0.6 per cent. copper per ton of slag, and slag at 40 per cent. silica, and that all necessary fluxing will be done with lime, the average run of ores of the plant carrying sufficient iron to permit this. We will simplify matters by neglecting flue dust, matte fall, grade of matte, difference in value of slags owing to changed composition, etc. Lime will be taken at 50 per cent. available CaO.

Our first ore will have an excess silica of 0.92 tons to be fluxed to a slag, or $0.92 \div 0.40 = 2.30$ tons slag containing 1.38 tons CaO or 2.76 tons limestone. We may assume that 12 per cent. coke will be required. Tabulating the costs we have the accompanying table.

COSTS OF SMELTING LOW GRADE SILICIOUS COPPER ORE.

(*a*) 2.76 tons limestone at 50c	$1.38
(*b*) 2.76 tons limestone, 12 per cent. coke at $12	3.97
(*c*) 2.76 tons limestone, labor, etc., at $1.50	4.14
Total	$9.49
(*d*) 1 ton ore, 12 per cent. coke at $12	1.44
(*e*) 1 ton limestone, labor, etc. at $1.50	1.50
Total	$12.43
(*f*) Slag loss, 2.3 tons at 0.6 per cent. copper. — 27.6 lb.	
2.76 lb. copper at 10c*	2.76

*Market price of copper taken at 12.5c per lb. f.o.b. N. Y.

Of these costs *d* and *e* are flat costs dependent on the mass of ore involved and amount to $2.94, from which we may assume a smelting charge of $3 per ton of ore; *a*, *b* and *c* are dependent on the insoluble in the ore and since the total cost $9.49 is due to 92 units of silica, it is correct to charge the smelting cost at 10.3c. or in round figures at 10c. per unit. Cost *f* is dependent obviously also on the silica. The price of copper was taken at 12½c. New York, less the 2½c. for converting, refining, etc. Reckoning this cost per unit of silica, we have an additional charge of 3c. per unit, making a total penalty of 13 cents.

We still have our profits to account for and it seems most equitable to proportion it to the investment in the ore and its value; therefore we will take 10 per cent. of the copper as profit. Since this yields only 10c. per lb. to the smelter, i.e., at the assumed price of 12½c., New York, the profit on this ore will be 10 per cent. of 120 lb., or 12 lb. which at 10c. equals $1.20 per ton; this must also cover any losses above 95 and 92 per cent. in silver and gold, should the ore contain these metals, and represent the profit for handling.

The figures I have taken as to costs are actual figures at different plants in the West, but not from the same plant nor taken at the same time. For example, $12 coke is a high assumption at this moment, but it was not last year; $1 for power, etc., applies to a medium-sized plant; 50c. for limestone is unusually low, etc.

Application of Results

We may now base our tariff on the figures obtained. It will run as follows: gold, $19 per oz.; silver 95 per cent. of New York market price; copper, 90 per cent. at New York market price of electrolytic wire bars, less 2½c. per lb.; treatment, $3 per ton; insoluble charged at 13c. per unit. This tariff certainly has a familiar appearance and carries the usual variations. Let us see how it would work on the higher-grade ore. In the smelting charge 0.25 tons silver requires 0.375 tons

lime or 0.75 tons limestone, and makes 0.625 tons slag.

COSTS OF SMELTING THE HIGH-GRADE COPPER ORE.

0.75 ton limestone	$0.375
0.75 ton, 12 per cent. coke at $12	1.08
0.75 ton, labor, etc., at $1.50	1.125
1 ton ore, labor, etc. at $1.50	1.50
1 ton coke	1.44
Copper loss 0.625 tons at 0.6 per cent. Cu. = 7.5 lb	0.75
Total	$6.27
CHARGES.	
Treatment 1 ton at $3	$3.00
25 per cent. silica at 13c.	3.25
Total	$6.25

The profit on this ore would be 10 per cent. of 1200 lb. copper or 120 lb. at 10c. which equals $12. This seems large but it must be remembered that it is a very rich ore, involves a large investment, and moreover, there is usually a sliding scale treatment charge in favor of the high-grade ores. Also ores of this grade would come in small amounts and involve more expense in handling.

Plotting this contract, using as ordinates the "producer's percentage" of the

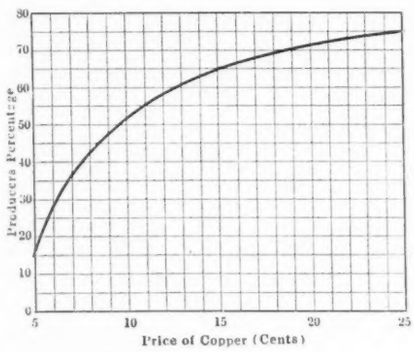


FIG. 4. PRODUCER'S SHARE FOR A 10-PER CENT. NEUTRAL ORE UNDER TERMS OF HYPOTHETICAL CONTRACT WITH VARYING PRICE OF COPPER

total value and as abscissas the per cent. of copper in the ore, and assuming a neutral ore with no excess silica, we get the curve shown in Fig. 3 showing that as the grade rises so does the miner's percentage. Plotting the curve shown in Fig. 4 for a 10-per cent. ore. using a variable price as abscissas, we see that the same thing happens for an increase in price. A moment's thought will show that as the proportion of gold and silver in the total metal value rises so will the miner's percentage. In other words, anything which causes an increase in the total value of the metal contents will increase the producer's portion, excepting the substitution of large amounts of base metal for noble metal, and Mr. Adkinson's tables are more representative of this condition of affairs than any other one thing.

I have necessarily omitted all reference to many things effecting the final results, such as fineness, sulphur, alumina, risk of change in market price, relative value of different quotations, etc., but I think I have shown that the peculiar (?) wording of contracts is based on justice and sound reasoning, and that flat rates are applicable only in special cases and are extremely liable to be unjust to one party or the other.

Shorthand by Machinery

According to the London *Times*, a machine has been devised for writing shorthand—a machine so simple that anyone can master it, and so efficient that even the highly trained stenographer cannot hope to do more than rival it. The "Stenotyper," as this wonderful contrivance is called, is in bulk and weight a mere fraction of the standard typewriter, and can readily be worked on the operator's knee. It has only six keys, and by permutations and combinations of these six keys, taken two or three together, a complete alphabet is built up—an alphabet of dot and dash, similar in kind to that of the Morse code. The learner has simply to commit this alphabet to memory, and the machine will do the rest. With less diligence than is often devoted to the acquisition of a mere parlor-game, any ordinary person should be able to write "stenotypy" at a serviceable speed.

This new shorthand is not based on phonetics. Its units are not single sounds, but syllables, many of which can be formed by one touch of the hand on the keyboard. As if playing the piano, the operator simply strikes a chord and imprints a character decipherable to the trained eye at a glance. Unessential vowels and consonants can be dropped out, for the grouping of the symbols indicates how they are to be read. Thus the second conspicuous advantage of the stenotyper is attained, i.e., the "note" which it writes is legible, not only to the operator, but to anyone else who has mastered the alphabet. Wilful idiosyncrasies and accidentally imperfect outlines cannot be introduced into "stenotypy." The note is necessarily correct in form, and, therefore, legible to all stenotypists, and at any distance of time. The third great advantage of the machine is that it can be used with equal facility for any language—provided that the operator knows that language.

The construction is of admirable simplicity. The keys print on paper that is self-feeding from an endless roll. A spring-lever and a few cog-wheels make up the essential working parts. There is none of the mechanical intricacy of the typewriter, and, therefore, there is nothing to go wrong. The machine is so easily portable and works so silently that there is no reason why it should not be used in ordinary reporting work; but for commercial purposes its usefulness is still greater; for the notes taken by one operator can be distributed for transcription among any number of clerks.

Volumetric Estimation of Lead

A. H. Low (*Journ.* Am. Chem. Soc., XXX, pp. 587-589) describes a method for the determination of lead in which the lead is precipitated as oxalate and subsequently titrated with permanganate. Calcium and antimony do not interfere with the method, nor does bismuth in small amounts. In a mixture containing 10 per cent. bismuth and 23 per cent. lead, the result was only raised 0.36 per cent.

One-half gram of the ore is dissolved, heated with sulphuric acid and filtered on a 9-c.m. filter in the usual manner. The lead sulphate is dissolved from the filter by means of a jet of hot sodium acetate solution. The sodium acetate solution is prepared by diluting a cold saturated solution of commercial sodium acetate with an equal volume of water and adding 40 c.c. of 80-per cent. glacial acetic acid per liter.

The original flask is replaced by a small beaker containing a little potassium dichromate and the washing continued. If any lead chromate appears, add the mixture to the original filtrate. If any precipitate shows in the flask, redissolve by boiling.

To the flask is now added 10 c.c. of a 5-per cent. solution of potassium dichromate, the solution is brought to a boil, and boiling continued gently for a few minutes to render the precipitate basic and easily filtered, which condition is shown by its reddish yellow color.

The solution is filtered hot and the flask and filter each washed once with hot water. The lead chromate is washed back into the flask with a jet of hot oxalic acid, using from 25 to 40 c.c., and the sides of the flask are washed down with a little hot water. The oxalic acid solution consists of a cold saturated solution of commercial acid 1 part, water 3 parts. Grain alcohol is added to the mixture in the flask and the whole boiled until the chromic acid is all reduced and the lead converted to oxalate.

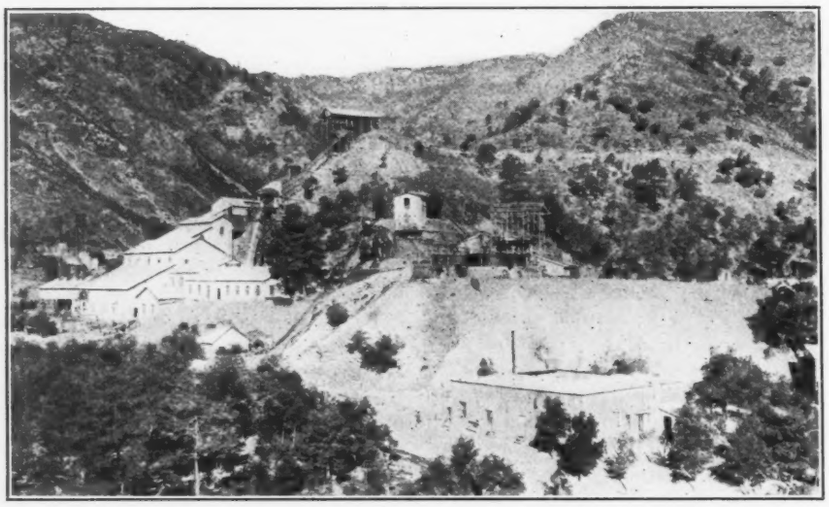
The solution is then diluted with 30 c.c. of cold water and thoroughly cooled. The cold solution is filtered through an 11-cm. filter, the flask washed out with cold water and the filter and precipitate washed ten times. The washed filter and precipitate are thrown into a flask containing about 125 c.c. of a hot dilute sulphuric-acid solution (5 c.c. strong sulphuric acid to 120 c.c. water). The solution is then titrated with a standard permanganate solution. The oxalic value of the permanganate multiplied by 1.642 gives the lead value; but under working conditions 1.669 is a better factor. It is best to standardize on, say, 0.2 gram of pure lead, running through the whole procedure. If desired the lead oxalate may be dissolved from the filter with a slightly stronger sulphuric-acid solution and the filter washed well with hot water.

El Rayo Gold Mine, Near Santa Barbara, Mex.

The Veins Are Developed from Adit Levels and the Silicious Ore Is Treated by Cyanidation and Zinc-dust Precipitation

BY CLAUDE T. RICE

The El Rayo property is situated in southwestern Chihuahua, Mexico, about 10 miles east of Santa Barbara. The district is sometimes included in the Santa Barbara camp, but since the ores are distinctly gold ores carrying little silver and practically no lead, and since the vein is entirely in an andesitic breccia, while at Santa Barbara the ore is mainly silver-lead occurring in a shale country rock, it seems better to consider this, the Azules district, separately from the Santa Barbara district.



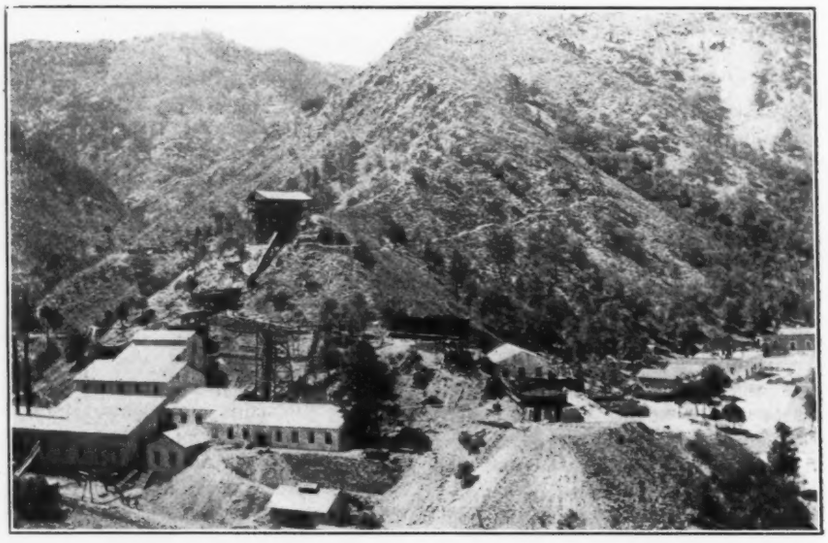
EL RAYO GOLD MINE

The Azules district, in which the property is situated, is not new, for ore was discovered by Mexicans about 18 years ago on the Azules property. Later, Americans discovered ore in other parts of the district and now all these properties have been combined under the El Rayo Mines Company, of Maine.

The district comprises a band of intruded or extruded andesite cutting in a north and south direction through the indurated cretaceous sediments which form the country rock in the greater part of southwestern Chihuahua. In this andesite a lens or egg-shaped mass of diorite has been intruded. While it is not clearly shown that there is any connection between the intrusion of this diorite and the formation of the orebodies, still, since the veins are roughly parallel to the diorite lens, it seems probable that the intrusion of this rock has caused parallel fractures to form in the andesite. Merely the shrinkage of the diorite mass may possibly have been the cause of the fracture, but it seems more probable that the fracturing was the direct result of the violence of the intrusion.

The Ore Occurrence

The main veins in the district have an approximately north and south strike and dip about 50 deg. to the west. The ore consists of iron pyrites, accompanied in certain parts of the vein by a little galena, chalcopyrite and sphalerite, in a gangue of quartz and silicified andesite.



EL RAYO MILL

Much of the quartz shows crustification, but considerable of the ore is simply silicified andesite, so that, while some of the ore was formed in open spaces, other of the ore was formed by impregnation. The ore carries mainly gold but there is also a small amount of silver present; at present, the ore treated at the mill averages about $19 gold and 4.5 oz. silver per ton.

The zone of oxidation is very irregular, for in one place oxidized ore has been found at a depth of 850 ft., while in another place sulphide ore is found within 200 ft. of the surface.

The veins vary considerably in width along the strike, apparently being widest near those places where a series of faults, having a strike of roughly north 60 deg. west, have cut across the veins, displacing them slightly (generally only 4 or 5 ft., but never more than 15 ft.). Near these faults the silicification and impregnation has extended into the wall rock forming larger bodies of ore at those points than elsewhere along the vein.

There are three main veins: the West Pettit, the San Jose and the El Rayo; from these, fingers or branch veins put off into the wall rock, some of which reunite with the vein while others do not.

The West Pettit vein, which runs at an angle with the two other veins, has been developed for a distance of 500 ft. on the adit level, 750 ft. below its outcrop. This vein is not as large as the San Jose or the El Rayo, for it only averages about 2½ ft. in width, but the ore is of good grade.

The El Rayo and the San Jose are both much larger veins, and, therefore, they have been developed much more exten-

sively. Both have a general north and south strike and both vary in width from 2 to 18 ft. On the El Rayo vein are the Descubridora, the North Rayo and the South Rayo workings, while on the San Jose vein are the San Jose, Adele and Azules workings.

Method of Development

All these veins have been developed by adits, for the rough, steep hills, in which the veins are found, encourage such development. These different adit levels have been connected by raises, and on the El Rayo vein several winzes have been sunk, the deepest of these being 150 ft. deep, and from the winzes short drifts have been driven. Considerable development has been done in the property, for over a mile of drifts has already been driven, but as yet little stoping has been done. The present company has mined only 30,000 tons of ore and the older companies did not ship very much ore owing to the fact that the railroad to Parral was not completed until 1900 and to Santa Barbara not until 1902.

As has been said, the veins are developed mainly by adits and as these adits have developed several hundred feet of backs much of the ore for many years will be mined from above them.

The walls of the stopes vary greatly in strength so that several different methods of overhand stoping will be used. In some parts of the vein a smooth fault plane forms the hanging wall, in other places the wall is jagged, being broken up by many small fractures or jointings, while in still other parts of the vein the boundary of the orebody is entirely a commercial one and there is no hanging wall.

Where the wall rock is strong, ore filling will be used in the stopes, but where the walls are somewhat broken up by fracturing so that in time slabs would scale off and mix with the ore filling if such a method were employed, open stull-timbered stopes will be used, the stope being filled with waste from time to time as mining advances. But in those parts of the mine where the wall rock is so weak that much waste rock is blasted down with the ore, the ore will be blasted upon staged stulls, and the waste sorted out will be used for filling.

Single-hand drilling and also machine drilling are used. Formerly only piston machines were used, but recently Waugh air-hammer drills have been introduced in the stopes, and it is expected that the number of men on the pay roll, now 400, will soon be considerably reduced.

Since the mine makes considerable water the company will have sufficient for all future milling requirements. The company also owns considerable timber land, so that it can furnish for several years all the timber and fuel required by the mine and the mill; it is, therefore, in a favorable condition compared to other mines in northern Mexico.

The wages paid at the mine are somewhat higher than in Parral, for miners and peons get 2 pesos, while timbermen get 3 pesos per day. A timberman has two helpers, instead of one as in the United States, so that they can handle the long stulls required in many of the stopes.

Mill Treatment

The north adit of the mine is connected with the mill by a short aërial tramway, but the ore from the south adit is trammed to bins in the mine cars, and then, after being hand-sorted, it is hauled by mule in a 6-ton car to the mill bin.

The ore is broken first by Blake crusher and then by roughing and finishing rolls to about 8-mesh size. Then it is fed to Huntington mills where it is crushed to pass through a 50-mesh screen. The pulp is concentrated on Frue vanners and the tailings are cyanided after being separated into sands and slimes. The lime is fed to the ore at the crusher, and so a good mixture of ore and lime is obtained; at present while treating oxidized ore 16 lb. of lime are added per ton of ore crushed.

In the cyanide plant the sands are treated by downward percolation in 25x6-ft. cylindrical tanks to which the pulp is fed by modified Butters-Meins distributors. The tanks hold 115 tons; it takes 36 hours to fill them, 150 hours for percolation, and 24 hours for draining and emptying the tanks so that the complete cycle consumes 210 hours or about 8½ days. Strong cyanide solution carrying 2.5 lb. cyanide per ton is used most of the time and then weak solution is used for washing.

The slimes are agitated in 25x16-ft. tanks by means of mechanical stirrers for a period of 24 hours. The strength of the cyanide solution is 3 lb. per ton; compressed air is admitted at the bottom of the tank so as to obtain proper aëration. A Merrill automatic discharge slime press and a Butters filter have been installed to handle the slimes. Experiments regarding the sands are now underway to determine whether to use complete sliming or not.

Zinc-dust Precipitation

Zinc-dust precipitation is used in treating the solutions, and this works admirably. At Mercur, Utah, the zinc dust is fed to a tank in which the dust and solution are agitated by means of compressed air and then fed by gravity to the filter presses, but here the zinc dust is fed by hand to a small cone where it is agitated in water by compressed air. This zinc-dust emulsion overflows through a small pipe to a larger 6-in. pipe placed low enough so that the solution from the "gold" tank will flow into it. This 6-in. pipe serves as a well for the suction pipe of the solution pump and consequently the zinc dust is intimately mixed with the solution as it is pumped to the Merrill precipitation press. Since this press is 200 ft. away from the well, a good agitation of the zinc and solution is obtained, and plenty of time is given for precipitation.

The length of pipe, through which the solution and zinc dust is pumped, is very important, for the precipitation does not appear to be instantaneous, either because a time factor enters into the precipitating reaction, or because of the failure to get an intimate mixture of the dust and solution.

At present the zinc dust is fed to the cone by hand at certain intervals, but it is planned to install at some later time the unpatented automatic feed used by Mr. Merrill at Lead, South Dakota. This consists of a feed belt, the drive-wheel of which is fastened by rope to a float in the gold-solution tank. As the surface of the solution falls, the belt is moved ahead a certain distance. On the belt throughout the distance which the belt moves during the emptying of the tank, the amount of zinc dust necessary for the precipitation is spread in an even layer, so that by this belt an even feed of zinc dust in the right proportion is obtained. The zinc dust falls from this belt into a cone-and-well system such as has been already described, so that everything is automatic.

This obtaining of an automatic regular feed is important in zinc-dust precipitation, especially in Mexico, for little precipitation of gold occurs in the press itself. Besides, by this method of feed the zinc-dust consumption is greatly reduced. The great advantage of zinc-dust precipitation, in addition to the excellence of the precipitation obtained by this method, is that the precipitate is always locked up and so all temptation to steal is removed; this also is an important advantage in Mexico.

The tailings are impounded and not allowed to flow into the *arroyo*, because the Mexican government, owing to the dependence of the inhabitants upon the surface streams for water, strictly forbids any pollution of these streams.

The zinc-dust precipitate is shipped to smelters, without refining, for in those districts of Mexico far from the railroad, such as the Azules district, the cost of freight and chemicals is too great to make it economical to refine the precipitate at the mine.

All labor about the mill and cyanide plant is Mexican except three on day shift and two on night shift, and of course an English-speaking superintendent.

Extraction Obtained

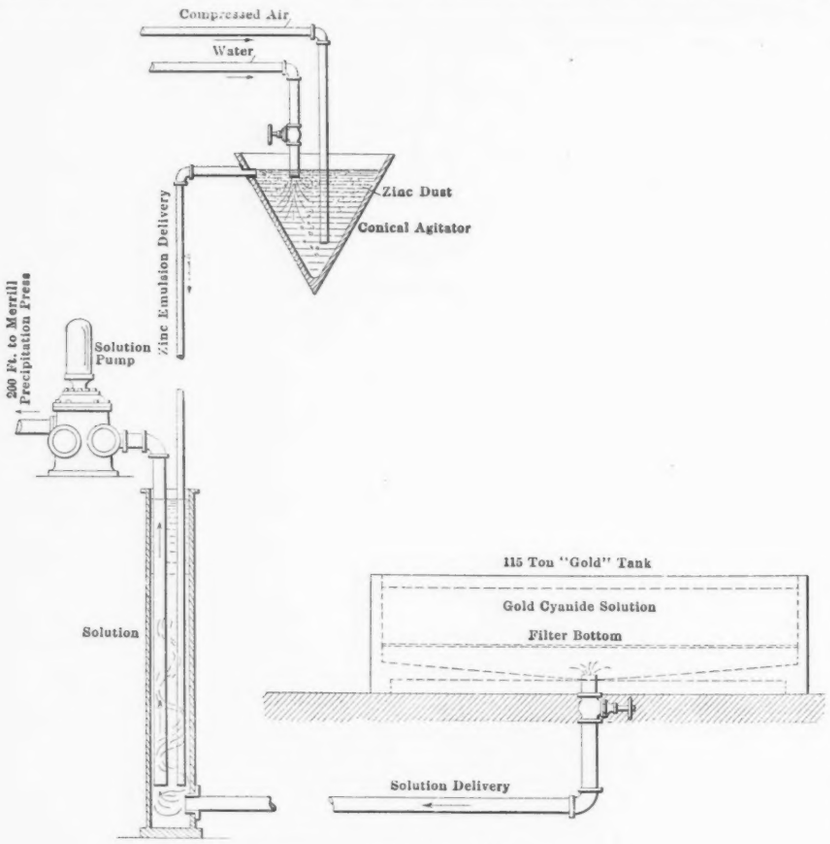
The mill and cyanide plant treat 110 tons of ore per day. At present the mill is designed for sand and slime treatment, but probably the ore will finally be treated by complete sliming and filtering.

The head sample now assays about $19 gold and 4.50 oz. silver. About 40 per cent. of the extraction is obtained from the vanners, which makes a concentrate assaying about $125 gold and 15 oz. silver per ton. The sand going to the tanks as-

says $10.31 gold and 3.6 oz. of silver per ton, while the slimes assay $14.70 gold and 4.65 oz. silver. On the slimes an extraction of about 90 per cent. was obtained when treating the sulphide ore in the Merrill presses, while on the sands the percentage of extraction is about 75 per cent. As at present about 35 per cent. of the crushed ore is slime and 65 per cent. sand, a total extraction of 88.15 per cent. is obtained, 18.9 per cent. of the total production assay value being obtained from the slimes, 29.25 per cent. from the sands, and 40 per cent. from the vanners.

While treating both sand and slime, four tons of cyanide solution were used per ton of ore treated, but at present, when only the sands are treated, only three tons of solution are required. When treating slime and sand 1.2 lb. of zinc dust is used per ton of ore treated, but when treating only the sand 0.6 lb. of zinc dust is required. Owing to the presence of a small amount of copper in the ore the zinc-dust consumption and the consumption of cyanide is higher than it would be otherwise. The head solution assays $3.75 gold and about 1 oz. silver per ton, but after zinc-dust precipitation they assay only a trace in both metals.

The wages of the mill men per shift of 12 hours are 2.50 pesos and at the cyanide plant 2.25 pesos, but the vanner man, a Mexican, gets 4 pesos. A total of 23 men are employed on both the shifts at the mill and the cyanide plant.



ZINC DUST FEED, EL RAYO MILL

Electric Power for Cement Plants*

By J. B. Porter†

The present consumption of cement is enormous. The great advantage of electric power for cement plants lies in its flexibility and capacity for economical subdivision. A small saving such as one cent per barrel justifies an elaborate expenditure, yet the cement industry is behind others in the application of electric power, while the opportunities for its successful employment are greater.

The manufacture of cement permits the division of plants into departments, each containing one operation comparatively independent of the others. This allows, with the employment of electric power, a close watch on the power consumption of each department.

The vital factor in cement manufacture is the kiln output, as this controls the output of the entire plant. The kilns should be worked to their full capacity. The factors which affect the output of the kiln are variation of speed of kiln, variation of feed of raw material, and variation of coal feed for combustion. Electric power applied to the kilns permits of a much higher degree of control than does any other form of power. For the crushers, a belt drive from an electrically driven line shaft, the motors to be equipped with automatic circuit breakers, provides the best protection for both motors and crusher. Sudden clogging of the crusher will throw off the belt and the gradually acquired overload will cause the automatic circuit breaker to work.

The buildings of a newly designed plant, where electric power is to be installed, can be arranged so as to permit the extension of each building as the expansion of the plant may require, while the designer will be independent of the necessity of accommodating the position of his buildings to the need of economy in the transmission of power either by steam pipes or rope drives.

One of the difficulties hitherto attending the use of electric power for driving cement machinery has been lack of information on the power required. Measurements have not been made in the past and, where motors have been employed, the power required to start the machinery has been so great and the changes so sudden that it has been impossible to take a reading. The writer hopes that a curve-drawing meter will solve this difficulty. Because of inability to determine the starting torque in the past, motors have been used with a capacity greatly in excess of the requirements. The writer admits that the starting torque, which is sometimes two or three times the running torque, will not permit the economical operation of motors capable of handling it and consequently running far below full load.

Alternating current installations are recommended because of the readiness with which motors may be protected from dust, the fewer spare parts needed, the extent to which wiring and automatic devices can be inclosed, thereby lessening the fire risk, the suitability of the motors for overloads, and the lesser first cost due to the higher voltage that can be employed.

Electric power is especially recommended because of the ease with which it is subdivided without loss of efficiency; each machine, having its own motor, can be shut down for repairs without affecting other machinery or requiring an expensive line shaft to be kept turning. As compared with steam, electric power is recommended because of the ease with which the power can be measured, not only for total consumption but for each department. It is thought that these advantages will more than compensate the mechanical losses due to generating power in a steam plant, converting to electric power in a dynamo, and using this through a motor.

*Abstract of the paper read before the Association of American Portland Cement Manufacturers.

†Of the Light and Power Department of the General Electric Company.

Short Talks on Mining Law—III

By A. H. Ricketts*

All valuable mineral deposits in lands belonging to the United States, both surveyed and unsurveyed, and the lands in which they are found, are free and open to exploration, occupation and purchase, except, by statute, in the States of Michigan, Wisconsin, Minnesota, Missouri, Kansas and Alabama, or if within a subsisting Indian, military, naval, and possibly park reservation, or land which is withdrawn from sale under authority of Congress or an executive order, or mineral lands below high tide, except in the district of Alaska (but without right to patent); coal or iron lands within the limits of a railroad grant, and all mineral lands within the limits of the right of way of a railroad. Mineral lands within an unpatented townsite, and land known to be mineral at the date of the application for patent for the townsite, are subject to location; mineral land, if situated within a forest reservation, or the limits of a grant to a State or railroad before patent issues is open to location.

Meaning of Certain Terms

The term "public land" as used in the legislation of Congress means such lands as are subject to appropriation as a mining claim, or subject to sale, or other disposition under general laws. The terms "unoccupied," "unappropriated" and "vacant" refer to land that is not in the possession of one who claims the right of possession by virtue of a compliance with the law, or who is diligently prospecting for mineral.

The terms "location," "mining claim" and "mine" have not the same meaning although sometimes used as of equal import. Strictly speaking, the term "location" refers to the acts constituting the appropriation of a segment of the public domain under the requirements of law; but it is often applied to the land taken up. A "mining claim" is a parcel of land containing mineral. In other words it implies a perfected location. It may consist of as many locations as may be deemed expedient to include therein. No land can be a "mining claim" unless based upon a location or its equivalent, otherwise it may be "mining ground," or a "mine," which are nearly synonymous terms.

It has been held that the term "mining ground" includes the vein specifically located, all the surface ground located on each side of it and all other veins or lodes having their apexes inside the surface lines. Yet, it has been held that if the term "mining ground" was equivalent to the terms "lands valuable for minerals" and "valuable for mineral deposits" it "would lead us into bogs and ferns of uncertainty respecting its interpretation as some lands have been held to be subject to location under the federal laws, which are scarcely to be regarded as the subject of mining in the ordinary sense." For instance, building stone worked as a quarry only, or bog iron or guano, which are not minerals.

It has been held that where land covered by an agricultural patent is worked for its minerals it is mining ground and not a mining claim within the meaning of a State law giving the right of lien to a miner for his unpaid work upon a "mining claim." So also that land within a Mexican grant is not a "mining claim" under that law, although many mines may have been opened within its boundaries and the owners of the grant claim such mines as their own.

A ditch appurtenant to and furnishing water to a mine has been deemed to be "mining ground" within the meaning of a State statute requiring the consent of a majority of the stockholders of a corporation to the sale of its "mining ground." While the bed of a navigable river within a State is not subject to location as a mining claim because it belongs to the United States, it is mining ground if mining is conducted thereon by the dredging process.

It has been held that an unworked placer claim was not a mine in the sense of a State statute providing for the summary sale of a mine in probate proceedings, the court saying that a mine or mining ground has no necessary identity whatever, with land patented as a placer mining claim.

The existence of mineral is not necessary to constitute a mine unless it is a "known mine" within the purview of the federal laws. In that case it must be an actual opened mine producing mineral at a profit, or shown to be capable of so doing, not theoretically, but as a fact. In general the existence of a mine is determined by the mode in which the mineral is obtained and not by its chemical or geological character.

The term "mine" implies that actual mining operations are being conducted on the property. The "process of mining" is the prospecting or developing of ground by shaft, tunnel or other opening or by quarrying, or the dredging of the bed or banks of a waterway to obtain mineral therefrom.

Right of Location

It follows that land subject to the process of mining is "mining ground," or a "mine" without regard to the nature of the title to the ground in which they lie, whether the work done yields profitable returns or not, or because the exigencies of some statute requires it to be placed in such category; that it is a "known mine" only when its exploitation shows it possesses tangible commercial value; that land is a "mining claim" when title is obtained in pursuance of the mining law, i.e., by location or by virtue of holding the same in the absence of an adverse claim for a sufficient time under the local statute of limitations and possibly the payment of taxes, to operate as a right against the United States for a patent therefor. Such possession is the equivalent of a location.

Although the Mining Act, in terms, limits the right of appropriation to citizens of the United States and those who have declared their intention to become such, a location made by an alien is merely voidable and subject to attack only by the United States in proceedings termed "inquest of office found," or by the land department in proceedings to obtain patent; or the question may be raised in an adverse claim suit by a party thereto, that is, a suit brought in opposition to the claim for patent. It is too late to raise this question for the first time in an appellate court. Naturalization before judgment acts retroactively upon the right of the alien to obtain the patent. The question of alienage is immaterial in all actions other than those above named, as until "office found," an alien may, under the weight of authority, exercise the same right of ownership in a mining claim as may those who are declared by statute to be competent locators.

It follows that an alien corporation may locate and hold an unpatented claim, but it cannot secure the government title thereto, in its own name, nor under the rulings of the land department obtain the same through a trustee. A patent issued to an alien is not subject to collateral attack upon that ground. By the terms of the act an alien may acquire patented mining property.

In 1898 Congress enacted that native-born subjects of the Dominion of Canada should be accorded certain mining rights and privileges in the district of Alaska, but the act has been declared to be impracticable and inoperative.

Generally a location may be made by any natural or legal person, without respect to the age of the former upon any day. It is not usually necessary for a locator to make location personally, nor specifically to authorize it to be made in his name, nor does it affect the validity of the location nor the right of such party therein that he did not know his name was to be used. All persons named in a location become co-tenants, or co-owners, as the act terms them, in the claim, with *prorata* interests therein, unless the contrary is stated in the notice.

Expenditures or Assessment Work

There does not seem to be anything in terms of the Mining Act to prevent a relocation by one who has defaulted in assessment work.

The actual commencement of labor or

*Member of the San Francisco Bar, San Francisco, Cal.

making improvements upon the land upon the last day of the term and its completion in the ensuing year is sufficient to prevent adverse relocation if continuous. It is "continuous" although suspended on Sundays and holidays. The law of assessment work applies to both lode and placer claims. It is wise and salutory and must be complied with to prevent pos sible adverse location until the land is paid for, as evidenced by the receipt of the receiver of the local land office. Nothing else excuses its non-performance, except when the claim is held adversely and the expenditure is prevented by force, or threats of personal violence by the person in possession.

As stated in a previous article, the work may be done within or outside of the claim or a group of contiguous claims. Such work must enure to the benefit of all and equal the amount that would be required if they were separate and independent, i.e., the work done must have a direct bearing upon the present or future improvement of the property, whether done within or outside of the property, as say, by the running of a tunnel from another claim or the construction of a wagon road say, leading to the claims. It is a question of fact whether such work, when done, tended to develop the locations within the group not worked upon, but it has been held that a court cannot substitute its own judgment as to the wisdom and expediency of the method employed in good faith for developing a claim. The number of locations embraced in such group is immaterial, except in case of petroleum-oil placer claims. In the latter case, under a special act, the group upon which the work is to be done must not exceed five claims in all, and the labor thereon must tend to the development or to determine the oil-bearing character of the locations within the group. In that act the annual expenditure is in terms confined to "labor" and "improvements" not being found therein.

Personal expenses, or the value of time spent in the effort to obtain means to develop property, is not sufficient—but the services of a watchman may be considered as in compliance with the law, if necessary to preserve tunnels, buildings or structures erected to work the property. That is, if it is intended to make use of the same within a reasonable time. But, if it is not intended to use appropriately the same within such time, or the watchman merely lives in a house upon the claim, or if his services are upon a naked mining claim to warn others against a relocation, his services do not constitute annual labor.

As was stated in a previous article, a statutory record of annual expenditure in the form of an affidavit is merely *prima facie* evidence of the facts therein stated and does not preclude other proof as to the truth or falsity of such statements. It may be filed before the time allowed by statute, but, if after such time, it is without legal effect. A failure to file such an affidavit within the statutory period cannot work a forfeiture of the claim. Its existence merely facilitates the proving of the facts shown therein.

Transvaal Mining Notes

SPECIAL CORRESPONDENCE

A syndicate has commenced work on the Transvaal silver mines, not far from Pretoria. Ecksteins did considerable work on this group many years ago, but it has been idle ever since. The present syndicate—consisting of B. and J. Weil, Sir Aubrey Woolls-Sampson and John R. Williams, formerly consulting metallurgist to H. Eckstein & Co.—has a working capital of £4000. Ten stamps are erected and will start work this month. The rich ore dump is sufficient to keep the mill going for 18 months or so. It is thought that the present mill can produce 100 tons of concentrates each month, going about 70 per cent. lead and 18 to 20 oz. of silver. On a conservative basis it is thought that the syndicate can earn about £4000 per year. It has a five years' lease on the property.

Last week the Goerz group of mines held the annual meeting, and the chairman gave a full account of the operations on the different mines during the past year. Many of the mines of this group are of the struggling class, and one of them—the Lancaster—is now running at a heavy loss.

In reading over the reports one is struck by the fact that there is far more hope in the future for the Eastern Rand, than there is for the Western Rand. The Lancaster and several other struggling mines of the group are on the West Rand, while the results obtained in the development of the two mines on the Eastern Rand, namely the Geduld and the Van Dyk properties, encourage one to think that here they will get two distinctly payable mines.

It is satisfactory to note that the Geduld is doing so well, for there was a fraud perpetrated on the public at this mine when the reef was first struck. In some way or other the samples were salted, and the assays showed such very rich results that the shares jumped away up. On re-sampling it was found that the values were very low and the shares dropped. This incident gave Geduld a bad name, and as the values kept low for a long time it was feared that the mine would prove a failure. There has been a steady improvement, and the directors have decided to erect a 50-stamp mill as a start. The Van Dyk is also considered good enough for a mill.

The profits made by the Rand gold mines for April amount to £979,028, an increase of £1135 over the previous month. The working costs varied on the mines from $7.72 per ton on the Jumpers mine, to $3.08 per ton milled on the Robinson mine. The average working costs for all the mines of the Rand works out at about $4.44, while the average for the whole of the Transvaal is $4.48. The average working profit per ton milled made by the mines of the Rand was $3.26, while the average recovery value was $7.69 per ton.

During the past few months one or two of the shares of the Rand have steadily advanced in price, in spite of the bad times. One of the most conspicuous has been the New Modderfontein mine. This mine has forged ahead in fine shape, and promises to be one of the great mines of the future. To start with, it has a very large area, over 1200 claims. The profits are now about £20,000 per month. At a special meeting of the directors held last week it was decided to increase the present capacity of the reduction plant fro... 30,000 tons per month to 45,000 tons, by the erection of additional stamps, tube mills and necessary accessory plant and buildings. It is calculated that the cost of this work will be approximately £100,000, and it will be met out of accumulated profits without interfering with the continued payment of dividends. The additional plant will probably be at work in about nine months' time. It is then expected that the New Modderfontein will earn £30,000 per month.

It is a great disappointment to many people to hear that the Gordon stope drill, from which so much was expected, has not come up to expectations. It appears that when tried for long periods, the machine is found wanting. Had it solved the great Rand problem of economical stoping in narrow stopes, it would have made a fortune for itself, and been a benefaction to the Transvaal.

F. H. P. Cresswell, the champion of the white labor policy, is stumping the Rand, preaching his doctrines. Like Peter the Hermit, he is full of his subject, and he is drawing many people to hear him. All are agreed that something should be done to increase the employment of white labor in the country, or the white man will be forced to the wall. The question is how to do it?—and it is not an easy one to answer.

With pig iron costing $25 per ton, old carwheels $20 and scrap averaging $16, a large foundry has sold 600-lb. wheels for $9@10 each, or about 1.5c. per lb. f.o.b. cars at works. At this price there was still a small profit. The capacity of this foundry was upward of 500 tons per day.

Platinum ocurs with gold in the sands of the rivers in the Choco and San Juan regions, Colombia.

Handling Blast Furnace Bullion at the Selby Smelting Works

By James C. Bennett

The accompanying drawings illustrate a method of handling bullion which has, after considerable experiment, been brought to a point where it gives good satisfaction; perfection would be too strong an expression to use, as the system is not entirely ideal, owing to the fact that it is still necessary to cool and re-melt the bullion. It will be understood that, in this smelter, the refining is done on the premises, hence it would be desirable, if conditions permitted, to avoid cooling the bullion. For the average smelter, however, which does no refining, the method here described would seem to approach very nearly to the ideal.

The Cooling Pot System

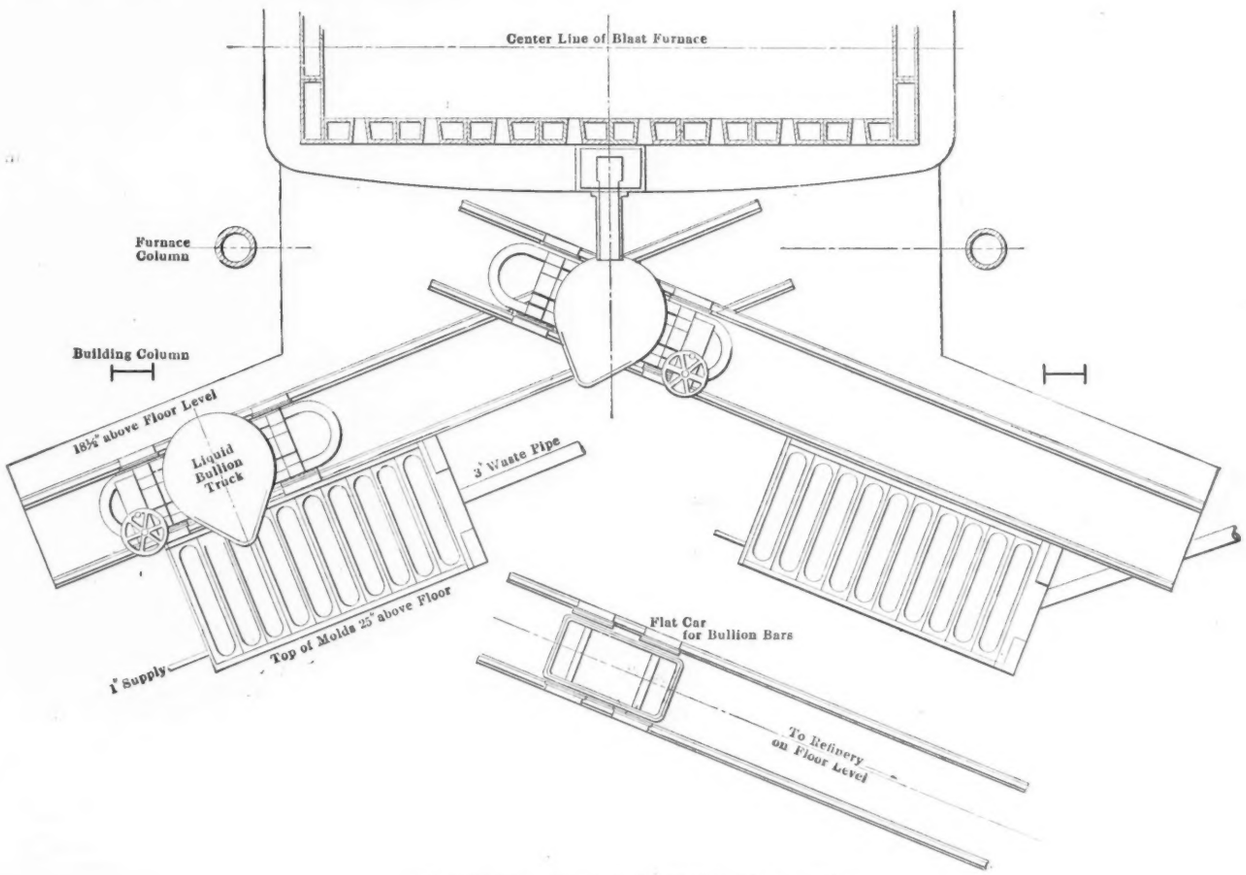
The method formerly used was that very commonly employed, of collecting the bullion in a "cooling pot," from which it is ladled into individual molds, then turned out and placed upon a car or truck for transportation from the furnace. This is, of course, a laborious way of handling, and, in the event of an unusually high lead production, becomes incapable of disposing of the output, as the molds have no interval in which to cool and the bullion therefore cools very slowly. In view of these two objections, it was thought advisable to seek some other means of handling, and the present method has, as has been stated, been finally brought to a state of comparative excellence.

The New System

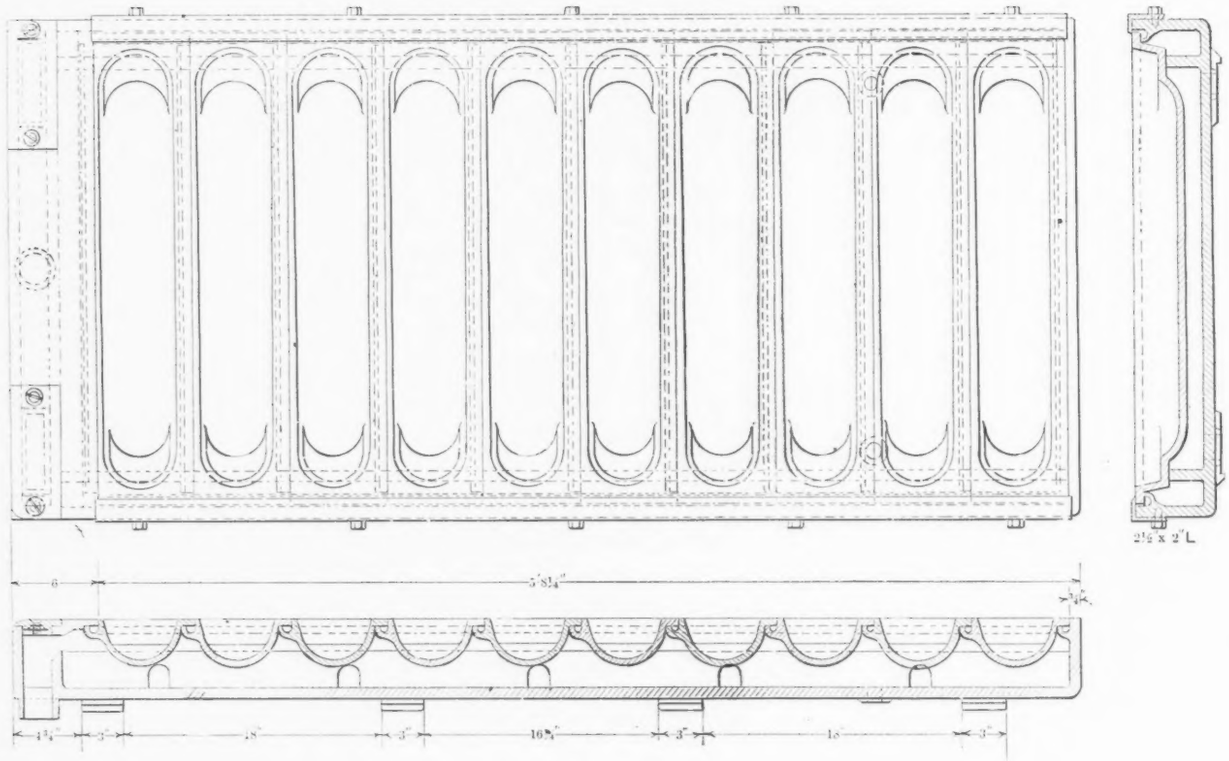
As the drawings show the arrangement of the parts, a detailed description is unnecessary. It may, however, be well to give some detail as to the operation and the difficulties that were encountered. In operation there is always a pot standing beneath the spout of the lead-well, for as the filled one is drawn away the empty is pushed into its place. If the lead be running quite freely a stopper of clay is placed in the spout during the change, otherwise it is allowed to continue running, as the little which falls to the floor can be easily cleaned up when a sufficient amount has accumulated. The full pot is drawn to the mold farthest from the center and gradually pushed back as the successive molds are filled. The capacity of the bowl or pot is just equal to that of the 10 molds which comprise one side; thus it is unnecessary to leave a small amount in the bowl to form a button. If the furnace has been hung up for a time for some repair, the pot will cool to such an extent that when again started the lead will chill and nearly fill the bowl until the temperature again approaches that of the bullion. This is accomplished by successive filling and emptying, a little at a time, thus avoiding the necessity of any special provision for maintaining the temperature during the time that the furnace is not in active operation. After the pot reaches the temperature of the bullion, there is no further difficulty on that account, as the interval between emptying and filling when running normally is insufficient for the temperature of the iron to drop greatly below that of the bullion.

Handling and Making the Molds

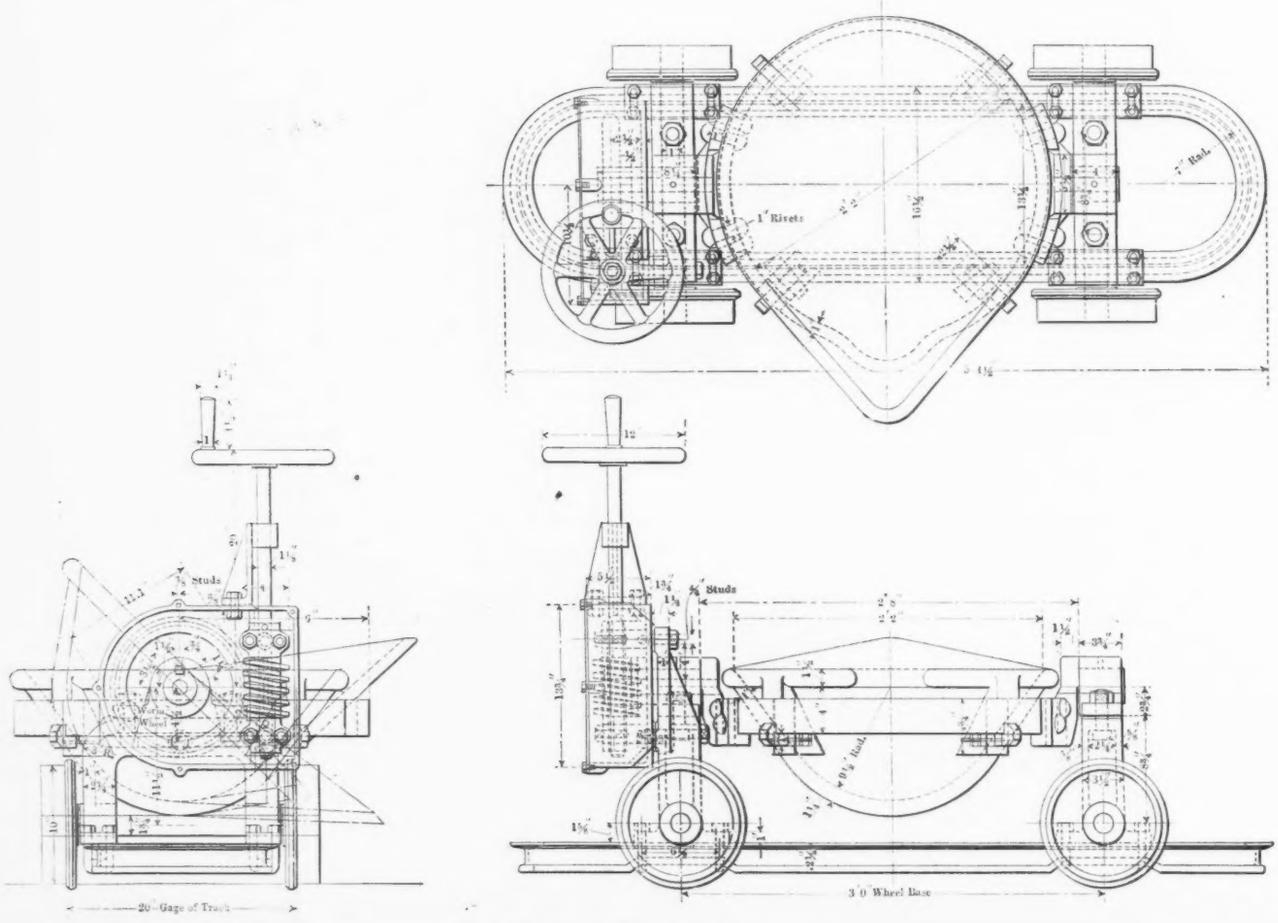
When solid, the bars are loosened by the use of a particularly sharp poll-pick which is driven into the bar with a short quick stroke, and the bar is pulled up and toward the workman, only enough to enable him to grasp it by the ends so that he can transfer it to the car or truck. It will be seen by the drawings that the width of the mold is slightly greater at one end than at the other. The wide end is set away from the pot, thus rendering it easier for the workman to remove the bar, especially if there be any unevenness in the casting. With the exception of cutting a shallow groove or slot in the edge of the bowl spout, better to guide the stream into the molds, there has been no change made in the truck from the design shown in the drawing. The molds,



ARRANGEMENT OF CASTING PLANT FOR BULLION



MOLDS FOR CASTING BULLION



TRUCK FOR MOLTEN BULLION

however, gave a considerable amount of trouble and have required a good deal of experimental changing. The original molds were cast in blocks of five each, cored out, making the bottom and sides in one piece with the five molds, the water being passed through them at the regular service pressure of about 40 lb. This will be recognized as similar to the practice of making cast-iron furnace jackets. In order to secure a smooth surface on the inside of the molds proper, they were cast bottom upward. The foundryman, however, found so much difficulty in keeping the core from floating, thus causing the iron to be very thin in the bottom of the block, that this plan was modified by casting the molds and sides in one piece, leaving the bottom open and securing the cast-iron cover-plate to the block by means of cap screws. This form developed a new difficulty, or rather another, as it is probable that it existed unexposed in the first attempt because the thin bottom condemned the casting before anything else could develop.

Difficulties in Casting the Molds

On casting the bottom-plate in a separate piece, the molds proper appeared to have porous or spongy bottoms, as they allowed the water to seep through the iron, thus rendering the mold and its entire block useless. The water came through in a somewhat irregular line running lengthwise of the mold. While the iron was cold the castings appeared perfectly sound, even when subjected to a pressure somewhat in excess of the 40 lb., but very soon after the molten lead was poured into it, causing the iron to be alternately heated and cooled, the leak developed. After trying two or three blocks to make certain that the trouble was not with an individual casting, one was broken up, when the cause was at once revealed. Bearing in mind still that the molds were cast bottom upward for the purpose of insuring a smooth inside surface, it will be seen that the iron, in casting, was obliged to spread over the top of the block and then to rise simultaneously on the sides of all the molds, finally joining the two sides at the bottom of each mold. The sheets of molten iron thus forming the sides were so thin—⅜ in.—that the faces or edges chilled before reaching the line of juncture along the bottom and so failed to unite or weld thoroughly, so as to speak, thus forming what the foundryman terms a "cold shut" in each individual mold.

After trying a second foundry in the hope that this difficulty might be overcome, the plan of having a multiple mold block was abandoned, and the general plan indicated by the accompanying drawings was adopted. A fresh problem presented itself with this arrangement, the leakage of bullion between the molds. This was not unforeseen, but the surprise was caused by the persistency with which the lead went into the pan. The first molds of this type were made with a flat ledge running along the side instead of the grooved one here shown. The possibility of lead leakage was thought of, but it was believed that the iron would chill the lead so that it would not get into the pan between the molds. When put into service, however, the lead seemed to granulate on striking the iron, as the pot passed from one mold to the next, and rolled through the cracks and into the pan, where it piled up, making dams the full length of the molds, and one between each two. Then followed the present grooved ledge, which was planned to contain a gasket of clay, oakum, lead pipe, or whatever might prove to be best suited to the purpose. The first attempt used no gasket whatever, and it was found that the lead itself formed one, the groove appearing to collect the particles until it had filled solid, after which comparatively little lead reached the pan. It is still necessary to clean the pan occasionally, but this can be done during the times of temporary shutdowns, and is thus cheaper than making machined joints between the molds. Attention is called to the fact that in these molds the only machine work necessary is the drilling and tapping of the hole for the supply pipe and those holes required to hold down the angle-irons and the hand-hole covers over the launder. It will be noticed that this style of molds, while water-jacketed, is not subjected to any pressure, as the top is open to the air—thus neither pan nor mold is so liable to leakage on account of a slightly inferior casting; and if any mold proves defective, it can be removed by loosening the angle-irons and without disturbing any of the others.

Capacity of the Apparatus

The quantity of water used is small, but, owing to the use of salt water at this smelter, it is found advisable to use pipes of liberal dimensions to provide for the filling up with the accretions carried in the water. The 20 molds of this type have never been crowded even when, on a few occasions, the bullion product of the furnace has been abnormally high; whereas with the old arrangement of 33 plain molds it was at times all but impossible to take care of an abnormal production with a furnace whose capacity was considerably less than the present one. This incapacity of the molds was due to the absence of the water-jacket, for the reasons that have already been stated.

Knocking the bottom-post from under the swinging doors of a cupola is generally done with a sledge. This practice has resulted frequently in death or injury to the cupola tender. By attaching a ring to the bottom of the post and conducting a chain to a simple lever about 30 ft. away the post may be pulled from under and all danger eliminated.

Turkish Quicksilver Mining

In *Rassegna Mineraria*, April 11, 1908, page 138, F. P. Monaci has given some details in regard to two plants for mining and smelting quicksilver ores in Asiatic Turkey. The mines are the Kara Bournou and the Koniah, both belonging to an English company.

The Kara Bournou mine is 30 km. from Smyrna and 3 km. from the sea. The ore is a silicious rock impregnated with cinnabar, the mineralized portion being in such a large mass that it can be quarried in open workings. This circumstance greatly reduces the cost of production and permits the treatment of very low-grade ore, even as low as 0.25 per cent. mercury. The average contents of the output mined and treated in the year 1906-07 was 0.75 to 1 per cent., and the average monthly output of mercury was 250 to 275 flasks.

The smelting plant includes two Spirek tower furnaces for coarse ore, and a Cermak-Spirek furnace for finer ore. The total capacity is 40 tons per day. The plant was completed and went into operation in May, 1906, since which time it has been in uninterrupted operation.

The Koniah mine is near the town of the same name, in central Anatolia, and at an altitude of 1800 m. Operation is somewhat hindered by the severe winters at this elevation. The district is richly mineralized, and mining operations date back to antiquity, judging from the relics of former mining villages and smelting plants. The ore occurs as an impregnation of cinnabar in a zone of silicious limestone. Work is at present confined to an upper layer of limestone in which about 13,000 tons of ore, averaging 1 per cent. mercury, has been blocked out. The smelting plant at this mine includes one Spirek tower of 15-tons daily capacity, and one Cermak-Spirek furnace of 8-tons capacity per day. The workmen, Turks, Armenians, Greeks and Kurds, are industrious and docile.

The immense size of its great orebodies, the fair grade of the ore, and the favorable natural conditions for their exploitation combined to make the Cœur d'Alene become the greatest lead-producing district of the United States, its only drawbacks having been remoteness from the great smelting centers and labor difficulties. The lodes are so situated that they can be worked to a large extent through adits levels. Up to 1903 at least 70 per cent. of the ore previously mined had been extracted through adits, at no charge for hoisting and pumping, and of the remaining 30 per cent. at least two-fifths had been hoisted through underground shafts, to be subsequently hauled out through tunnels. The Tiger-Poorman was the only mine operated always by shafts from the surface.

Fighting Fire in an Anthracite Coal Mine

Many Problems in Timbering and Ventilation Were Encountered. Mine Was Flushed Full of Clay. Dangers from Gases Overcome

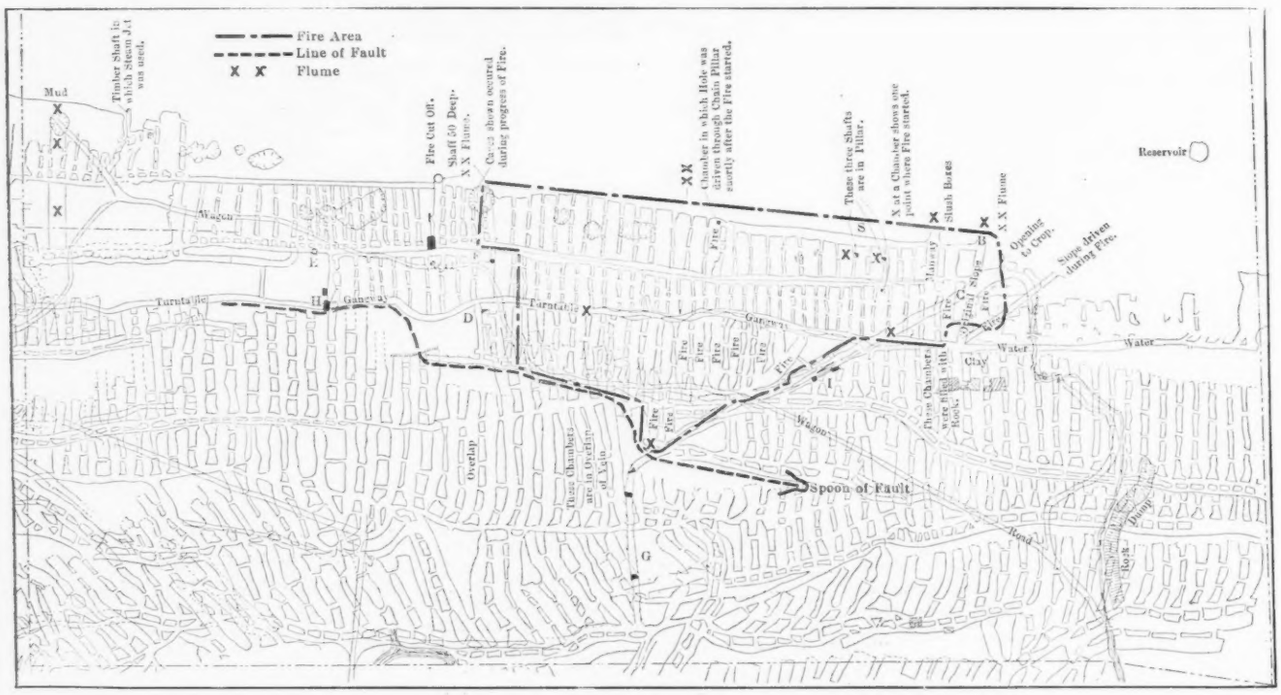
BY P. H. DEVERS*

The Jersey mine of the Delaware, Lackawanna and Western Railroad Company was opened about 1860 in the Red Ash seam, in the southwestern section of the Wyoming valley coalfield. The mine was developed by two slopes. The original slope is about 350 ft. long on an average dip of 35 deg. at a depth of 350 ft. Two gangways were driven on the strike of the seam, one east of the slope, for a distance of 2000 ft., and the west gangway about 5000 ft. Chambers were turned at right angles to both gangways and driven directly up the pitch to within 50 ft. of the outcrop; at this point a chain pillar was left to prevent the surface water from flowing into the mines. After several chambers were driven up to the chain pillar on the west gangway, the coal was drawn out and the rooms abandoned. A counter slope was driven from the head of the original slope diagonally across the pitch, also across old chambers driven from the west gangway of original slope. The counter slope intersected the west gangway driven from the original slope about 450 ft. west, and was continued for two lifts below, or a total distance of 1200 ft. At the foot of the slope, an overlap fault was struck. A tunnel was driven in the conglomerate measures through a fault connecting the Jersey and Avondale workings. At this time the counter slope was converted into a gravity plane; and all the coal mined afterward in the Jersey mine was lowered to the Avondale.

Securing a Water Supply

About 1893, the Avondale mines underwent a general squeeze, which cut off all the workings north of the shaft, including the Jersey workings. On May 18, 1901, at about 7:30 p.m., a large volume of smoke was noticed coming out of the original and counter slopes. The officials of the Avondale mine were promptly notified and at once went to the scene. Upon their arrival they found a large fire raging about 300 ft. below the surface on a counter slope. The officials at once organized a large gang of fire fighters and immediately started to lay a line of 4-in. pipe from the mouth of both slopes to the artesian well about 4000 ft. northeast. Although the pipe was laid within a short time, unfortunately the water supply from this source soon gave out. This made it absolutely necessary to lay a line of 8-in. pipe from the Avondale swamp at the Ross shaft up over the mountainside, a distance of 4500 ft. to a reservoir situated about 300 ft. northeast of the slopes. Two 3-in. siphon pipes were laid from the reservoir to the fire. A Jeanesville pump having a capacity of 750 gal. per min., and built for a lift of 1000 ft. was taken from No. 1 shaft, Auchincloss mines, and installed at the swamp to pump water to the fire against a head of 375 feet.

The work of installing the pump and laying a pipe line was completed with all possible despatch, but the fire had lost no time. The timbers had burned out in both slopes, and cave-ins had allowed the fallen débris to attain to a white heat. The men were employed reopening the counter slope, which had to be accomplished in face of the most intense heat, gradually fighting the fire as they advanced. Good progress was made for about 75 ft. between the head of both slopes. At this point an empty chamber 30 ft. wide, and on fire, was encountered. After making a heroic effort to fight the fire back and cross this chamber to follow the fire down the slopes, the plan had to be abandoned. A large slush box holding 2000 gal. of water was erected on the surface and a sluice was laid from the outlet of this box to the empty chamber. A large gang of laborers was employed to



MAP OF THE JERSEY MINE OF DELAWARE, LACKAWANNA & WESTERN COAL COMPANY, SHOWING FIRE AREA

*Assistant district superintendent, Delaware, Lackawanna & Western Coal Company, Plymouth Township, Penn.

fill the sluice with clay, while the box was filling with water; this operation required four minutes. The water was then instantly liberated into the sluice and the clay was washed into the empty chamber. After a time this plan also had to be abandoned.

The officials then tried to sink a new slope through an old chamber 600 ft. west of the counter slope and through the chain pillar. I might add here, that the chamber referred to was opened from a water-level gangway driven along the strike of the seam above the chain pillar, which is left at the face of those chambers driven from the west gangway of the original slope; the outcrop of the seam is 300 ft. higher on the mountain on the west side of the slopes. A force fan was erected by the time the men reached the chain pillar, and air was forced to them. After working two days on a pillar, they succeeded in breaking a hole through to an old chamber, but this feat came near costing the lives of the men on the shift. The great outrush of carbon monoxide (white damp), which was penned up in old workings, immediately found vent and overtook the men before they could retreat; fortunately, the miners did escape, and had enough presence of mind to drag their semi-conscious companions with them to safety. All tools, fan, etc., were lost. The cause of this sudden outrush of gas was due to the hole being driven through the chain pillar at an elevation 50 ft. higher than the mouth of both slopes.

When the hole was broken through the chain pillar, the slopes immediately became the downcasts, and the hole the outlet. This change in the direction of the air currents allowed the latter to cross the top of the old chamber on the original slope, and to start to force their way down the counter slope through the fire and cave-in. The loading and handling of all débris had to be accomplished in wheelbarrows by two men being hooked up in harness to pull, while another pushed on the handles.

While some progress was thus made, the men found themselves working in loose rock 40 ft. over the coal seam, with the fire underneath. This plan was then abandoned, streams of water were left running over the loose rock and a new plan was adopted. This latter scheme was to work down the original slope, and was carried on successfully to the first crosscut driven on the west side to the old chamber, which had given so much trouble. A windlass was erected in this crosscut and a counter slope was started across the old chamber, which had caved, also through the pillar under the counter slope. The intention was to get on the slope, reopen it, and follow the fire. The windlass was used to hoist a small truck, and four men were employed to turn the windlass on each shift. Such were the discouraging conditions under which I assumed charge of the fire on Oct. 1, 1901.

Plans for Fighting the Fire were Changed

About four months after the fire had started, W. F. Powell was appointed foreman on the opposite shift; one week later we got together and decided other plans had to be adopted in order to successfully combat the flames. While working on the night shift, I discovered an old crosscut on the east side of the original slope and immediately stopped the three o'clock shift from working at the face, and started to explore the old workings on the east side. After working our way through the crosscut we found ourselves close to the face of an old chamber and a crosscut leading to the next chamber on the east. We worked our way gradually across five of these chambers, which were driven from the east gangway of the original slope.

It was here found possible to descend with a rope and we lowered ourselves about 350 ft. to a body of water, which was found to be the east gangway, and filled to within about 3 ft. of the roof on the upper rib. Some planks were sent down, and a raft constructed; two of us pushed our way back toward the original slope on the raft, and found, after coming back to the fifth chamber, that we had reached the original slope pillar. I may also add, that our print was incomplete, but accurate, all there was to it, as only the gangways, slopes and tunnels were shown. No surveys had been made of the chambers or airways.

Thus finding it possible to reach the slope on the gangway, changed the whole plan of fighting the fire, for it gave us valuable information. After consulting with Mr. Powell, foreman, and Montrose Bonnard, district superintendent, it was decided to install boilers and a pair of 10x 12-in. Lidgerwood hoisting engines on the surface east of the original slope; it was also decided to drive a hole through the chain pillar in line with the engine; erect a sheave wheel and start a slope across the old chambers and through the pillars to a point we had reached on the raft above water level through the slope pillar to the west turntable or fire gangway. This work was started on Oct. 11, 1901, and on Oct. 21, we had reached the west gangway, as we thought then below the fire. It was here discovered that the west gangway on the slope pillar was blocked with baked clay, which accounted for the large body of water east of the slope. Evidently this was the clay and water that had been flushed into the open chamber from the slush box.

A Successful Plan of Operation

The gangway was open for about 50 ft., but a large fire could be seen in the distance. We proceeded carefully, timbering every inch of the ground until we could reach the fire with two streams of water. The moment water was turned on the fire, the steam and sulphur fumes drove us out to the surface. We shut the water off, waited for the steam and sulphur fumes to clear away, fastened both lines of hose so as to reach the fire, withdrew our men and turned the water on. After five hours of impatient waiting, the fire had cooled sufficiently to allow us to proceed. The flames here raging proved to be at the entrance of the old chamber, which we found so much trouble to cover over between the slopes. We loaded out the cooled débris, timbered and forepoled our way through the cave; put in a frame set at the entrance to the chamber, secured nozzles made out of 1-in. gas pipe in 8-ft. lengths, pushed them as far as possible up the pitch into the fire, withdrew our men and turned on the water. It was our intention to cave the chamber and prevent any sudden fall from closing in on our gangway timbers and entombing our men.

This caving plan proved so successful that we immediately adopted it and caved all our open chambers as we advanced on the gangway for 1250 ft. through a solid wall of fire. In all, we crossed 36 chambers on this gangway, on some occasions requiring two weeks to cross one chamber. The delay in crossing was due to rushes of coal and rock all on fire, which at times filled the gangway for 25 ft. On again reaching the face after these rushes of fire, we always found a pitch chamber partly opened and could see the chain pillar at the face on fire, also the roof of the chambers were at a white heat. This was a beautiful sight and was similar to standing and looking into a blast furnace. We at once forepoled the timbers to the cave with 25-lb. T-rails, and 3-in. pipes and covered the same with sheet iron to prevent any more rushes coming in on the gangway.

We then proceeded to push 1-in. gas pipe nozzles up to the fire, fastened on the hose, withdrew our men and turned on the water. The water coming in contact with the fire caused heavy explosions and in a very short time caved the open chamber, thereby allowing all the rock and coal to rest on timber. We then proceeded as before to open the gangway to the next chamber. About the time we reached the point where the counter slope intersected the west gangway, R. A. Phillips, superintendent, paid us his first official visit. On passing by this place, Mr. Phillips, called my attention to the large amount of heat coming up and said, "young man the fire has gone below you on this slope." I had purposely passed this point to see if Mr. Phillips would notice the heat coming up; as Mr. Barnard, district superintendent, and I had always differed on this question. I had maintained that the fire had gone down the slope into the lower workings, which afterward proved to be correct, but Mr.

Barnard was of the opinion that the heat from the fire on the gangway was working down through the west chambers and coming up the slope.

An Old Shaft was Reopened

After this investigation it was decided to erect 12x14-in. Lidgerwood engine boilers and a derrick at the old shaft, 1000 ft. west of the slopes, and reopen this shaft. The timbers of the shaft had rotted out, allowing a large quantity of clay and débris to fall down completely filling the shaft for a distance of 130 ft. This pit passes through the Red Ash seam at a point 40 ft. on the pitch of 45 deg. south of the gangway that we were working in at the slope end. Our reason for reopening this shaft was to work our way up through the chute to the gangway to meet the fire and if possible to prevent it from spreading. Upon reaching the fire, our intention was to drive a chamber out to the surface and cut the fire off.

After opening the shaft, we made good progress for a short time, but the firemen at Woodward, Pettebone and Avondale mines went on strike and shortly afterward the miners at these collieries joined the strike in sympathy with the firemen. The strikers were not satisfied until the fire fighters had joined their ranks. Although no coal had been mined in the Jersey workings since 1893, this strike hampered us to a great extent. But after employing new men, whom we had to board and protect on the property, we decided to retreat 250 ft. west of the shaft and reopen a chamber, which was 98 ft. wide, pitching 45 deg. on the line of the shaft, and work our way up; upon reaching the face, we proposed to drive to the outcrop. This plan proved a large and dangerous undertaking. We constructed a jugular manway along the right rib and gradually worked our way to the face, and drove a chute through the chain pillar to the water-level gangway.

As a reward for our labor we got a shower of fire, which nearly trapped our men. We built an iron battery in the chute to prevent the fire falling into the chamber, and laid two lines of hose up the manway, making a desperate effort to get our water-level gangway to cut the fire off, but with little success. About this time H. G. Davis was appointed district superintendent, Mr. Barnard having resigned. Wm. E. Walters was foreman on the opposite shift. After holding a consultation, it was decided to sink a new shaft from the surface a depth of 130 ft. to the water-level gangway about 400 ft. west of this chamber. It was also decided to reopen a gangway leading from No. 9 plane, Avondale mines to the Jersey tunnel, which was driven through the fault at the foot of the counter slope, and reopen it to cut the fire off and meet the men working down through the fire from the west gangway. This was also accomplished, but the heat was so intense that the men worked in relays of about 3 min., naked with the exception of gum boots and trousers. After the slope was connected to the tunnel, we had the fire surrounded, and it was then decided to erect a dam in the tunnel. This tunnel was the only opening which was driven through the fault.

The line of fault also passed from the bottom of the slope near the foot of the old shaft and intersected the fire gangway about 300 ft. west. The gangway from this point ran parallel with the fault. We worked our way in this gangway until we found a chamber driven to the water-level gangway, and in which no crosscut was driven to the west; this made a good chain pillar, so we decided to erect a dam on the gangway on this pillar. We were considerably hampered during the erection of these dams by the large percentage of carbonic acid gas (blackdamp) which was flowing into and mixing with our air current from the fire and old workings.

The construction work was accomplished by gangs of men, one gang relieving the other about every five minutes in order that the men who had been working on the dams might go back into a fresher air current. After completing the dams and reopening the water-level gangway from the new shaft, until we reached the fire at a point not exceeding 40 ft. west of the line chamber, we retreated 60 ft. west of the fire on the water-level gangway and reopened a chamber through to the shaft 50 ft. deep on the outcrop, and constructed dams across the water-level gangway on the chain pillar. This completed the actual work of fighting the fire underground, with the exception of building flumes from the surface to the foot of the counter slope; also to the head of the old shaft and to the hole we had driven to the outcrop. We also sunk a 6-in. bore-hole from the surface to the face of the chamber on the shaft line, and built a flume on the mountainside, connecting same with the bore-hole. We then laid 4-in. water mains to the flumes and employed a large number of men with teams, plows and scrappers, and started to haul clay, which they had plowed up, to the flumes and then washed it into the mines. This plan was continued until the entire mine was filled with incombustible material and the fire put out, after four years of the most hazardous and difficult work. The work of extinguishing this fire was fortunately accomplished without serious accident or loss of life. The last chamber driven to the outcrop and also the dams constructed on the water-level gangway were done under the supervision of M. V. Lewis, inside foreman, at the Avondale mines.

Method of Timbering

The following is the method of timbering, ventilating, blasting and treating persons overcome with carbonic acid, CO_2 (blackdamp) or carbon monoxide, CO (whitedamp), also the approximate number of gallons of water pumped to the fire:

All set timbering consisted of a 5½-ft. collar between notches, 7-ft. legs having 2½-in. pitch to a foot; this stood on a mud sill 8 ft. 5 in. between notches. The center of the collar was lagged and forepoled where necessary with 3-in. wrought-iron pipe, 25-lb. T-rails and sheet iron. Four employees, called hosemen, were constantly on duty patrolling the gangway and openings left in the rear of the men employed at the face, to watch the timbers and prevent the same from burning out.

Ventilation

All known systems of ventilation were tried at various times during the progress of the fire. Hand fans were used in isolated hot holes and a steam jet was employed in the timber shaft on the outcrop to keep the current heavily charged with CO_2 (blackdamp) moving in the same direction. A force fan was driven with a water-wheel by using the water which ran down the counter slope to the tunnel through the fault, and gave good results. The force-fan method did not give good results at the old shaft; its use drove carbonic gas up about 40 ft. in the shaft, at which hight the gas remained making it impossible for us to descend.

The exhaust-fan system gave good results in the old shaft, located at the same point and ventilating the same workings where we had tried the force-fan system; the same fan was used for both methods. The fire itself was used to good advantage at times, when feasible to produce ventilation. All blasting was done with C. Atlas 40-per cent. dynamite. The dynamite was placed on top of hot rocks and wrapped in water-soaked canvas or blue clay and fired with a short fuse; no holes were drilled in the rocks at any time, although, approximately, 25 short tons of powder were used during the period the fire was fought.

During the progress of the fire it was a common occurrence for men to be carried out unconscious, overcome by carbonic acid, CO_2, or carbon monoxide, CO. These victims were quickly treated and restored to consciousness by resorting to artificial respiration and using the powerful heart stimulant, ammonium nitrate, inhaled by saturating a handkerchief. The patients were also given medicine containing ingredients prescribed by Dr. D. H. Lake, Delaware, Lackawanna & Western surgeon.

Amount of Water Used

The approximate amount of water pumped to the fire in 33⅓ months, or 1000 days, by a 20x7½x24-in. Jeanesville duplex pump, running 200 strokes per minute, and in operation 22 hours each day amount to 990,000,000 gal., besides the

large amount of surface water caught on the mountain water shed and conducted to the reservoir, and siphoned to the fire during the wet season of the year. This vast amount of water had to be repumped up the No. 1 slope and the 'Ross shaft, Avondale mines from the No. 2½ west lift, Red Ash seam, by a 24x48-in. Duplex Jeanesville pump, besides the regular mine water against a head of 440 feet.

During the time the clay was being flushed into the workings through a hole driven through the chain pillar at a chamber 600 ft. west of the slopes, and the hole was being filled to the surface level, an explosion occurred, which blew the baked clay and ashes for hundreds of feet on the mountainside, similar to a volcano sending up lava and ashes from its crater. This hole was immediately reflushed and has since remained intact.

The method of crossing hot chambers above the seat of the fire was to construct overhead canvas airways, which were kept continually wet to prevent the canvas from burning; the hot air and gases were passed back over the heads of the men. This method proved successful.

The following is a report of David T. Davis, inspector of mines 8th Anthracite district, to the Department of mines on the fire, in his report for 1905: "I am pleased to be able to report that this stubborn and serious mine fire, if not entirely extinguished, has been so surrounded by incombustible material that it will be practically impossible for it to spread into any other part of the adjacent old workings."

The fire was discovered on May 18, 1901. The origin has always been a mystery. It has cost the company a tremendous amount of money. The officials and workmen engaged at this work have also suffered a great many trying ordeals, and are well pleased with the conditions existing at present, as the work of fighting a fire of the magnitude of this one in old abandoned workings where no system of ventilation could be adopted or applied, is a problem that taxes the ability of the most competent mining men.

Many ways of decreasing the injurious effects of coal dust on miners have been tried in foreign countries. In these methods either the dust is allayed by spraying or it is prevented from entering the lungs of the miners by respirators. With regard to the latter devices, the miners object mainly because such machines hamper conversation with a near-by partner. At the St. John del Rey Mine, Brazil, helmets supplied with air from the compressed air pipe are worn by the machine men. The small rubber pipe, which brings the air to the helmet, can be detached instantly by means of a connection, the valve in which closes automatically when detached. Expansion cools the air, and renders work in a hot seam more pleasant.

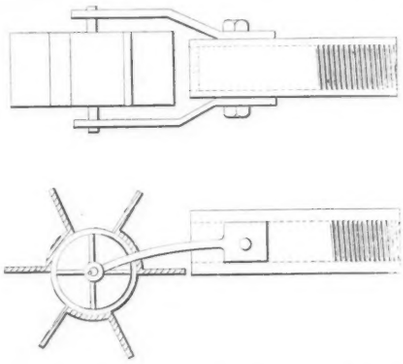
Coal Mine Dust

In *Annales des Mines,* Dec., 1907, F. Breynært states that systematic watering of coal-mine entries has not become general in England, and is practiced only in Wales and in a few collieries in Durham. In the Cardiff district, 62 mines are provided with systems of water under pressure, having about 250 miles of pipe. The Llwnypia colliery has a water main passing through all the principal entries; for a distance of 200 yd. from the shaft the entries are sprinkled with a hose and nozzle; beyond this distance the mains are furnished with jets from point to point, which shoot out sprays of water into the entries.

Cost of Installation

The cost of installing such an arrangement is about as follows:

8.8 miles of 1½-in. pipe	$5000
Junctions	105
Brackets and hangers	165
¾-in. nipples	340
Labor of installation	480
Hose	60
Total	$6150



PLAN AND SECTION OF WATER JET SPRAY

In the mine wherein this equipment is installed, the expense of watering amounts to 0.4c. per ton of coal hoisted; this figure includes interest on the cost of the plant but not its depreciation, nor the cost of the water, which might in some circumstances, be considerable. In the Durham collieries, the cost is estimated at 2c. per ton.

In the Browney colliery, Durham, a plan has been adopted which is economical of power and water. The water is applied wherever it is most wanted, while the scheme does not permit the discharge of an excessive amount, to the detriment of the passageway. The installation includes a little pump of 2-in. diameter, and 6-in. stroke, which gets its water from a small tank fed from a main and regulated by a float-valve. The pump is driven mechanically by the passage of the trip. In an entry where head and tail rope are used, the tail rope passes over a pulley which transmits its power to the pump. Where an endless rope is used, the pump is driven by a chain which engages the cars as they pass by; in this case the pump works only when a trip is going by. Each pump delivers water to one, two or three pipes which span the entry at a distance of 300 ft. apart. On the under side of each of these pipes are spaced five or six spray jets made of ¾-in. pipe, closed at the end and pierced by a very small hole. A little paddle-wheel affair, made of sheet tin soldered together, is fastened to each jet to aid in pulverizing the stream of water. One form is shown in the accompanying figure. The amount of water projected by one of these sprays is about one quart per minute.

Labor and Accidents in British Columbia Coal Mines

The report of the Department of Mines of British Columbia for the year 1907 gives the following statement of the labor employed at the coal mines of the Province during the year:

	Underground.	Surface.	Total.
Management and office	112	64	176
Miners	1,871	....	1,871
Miners' helpers	560	....	560
Enginemen & mechanics	541	534	1,075
Laborers	759	493	1,232
Boys	158	47	205
Japanese	132	42	174
Chinese	273	470	743
Indians	3	20	23
Total	4,389	1,670	6,059

The total coal mined during the year, with its disposition, was as follows, in long tons: Sold for consumption in Canada, 916,262 tons (41.3 per cent. of total); sold for export, 673,114 (30.3); used for making coke, 419,541 (18.9); used at collieries, 165,931 (7.5); added to stocks on hand, 44,760 (2.0); total, 2,219,608 tons. The average coal mined per employee, including all classes, was 366 tons; per miner, 1186 tons.

The production of coke was: Sold for use in Canada, 155,579; sold for export, 60,110; added to stock, 7224; total 222,913 tons. The average yield of coke was 53.1 per cent.; that is 1.85 tons of coal were used in making a ton of coke.

The number of accidents in coal mines for two years past is reported as follows:

	Number		Per 1000 Emp.	
	1906	1907	1906	1907
Killed	15	31	3.12	5.12
Seriously injured	36	61	7.49	10.07
Slightly injured	32	62	6.66	10.23
Total	83	154	17.27	25.42

The increase in the number killed and injured last year was large; 85.5 per cent. in number and 47.2 per cent. in proportion per 1000 employees. The causes of accident reported were: Gas explosion, 1 killed and 19 injured; falls of coal and rock, 10 and 37; mine cars and timber, 8 and 42; powder explosions, 1 and 6; miscellaneous underground, 1 and 8; on surface, 10 killed and 11 injured. Falls of coal and rock were responsible for 32.3 per cent. of the deaths, and 30.3 per cent. of the injuries. In 10 years there have been 413 employees killed and 656 injured in British Columbia collieries.

Colliery Notes

It is better to have a good fire and a bad boiler, than a bad fire and the best possible boiler.

In order to reduce the dust in German mines, holes are drilled in the solid coal and water at a high pressure is forced in for some considerable time before the coal is shot down.

A considerable falling off took place last year in the quantity of foreign coal imported into Spain; the returns just issued show a total of only 1,888,032 tons as compared with 2,199,097 tons the previous year.

In designing a mine car, remember that it is of the utmost importance to keep the wheels as large and the axles as small as possible, consistent with the strength of the latter; upon the ratio of the two depends the friction.

Although the coal mines of Belgium are looked upon as being among the most dangerous in the world, such care is taken to insure the safety of the miners that the total death rate during 1901-1904 was only 10.10 per 10,000 employed.

Pressure gages on steam engines should be tested by occasionally shutting off the steam and letting the pointer run back to zero. The average or safe-working pressure of a boiler should be indicated on the pressure gage by a prominent red line.

The Erie Coal Company, of Pittston, Penn., hereafter, will discharge and refuse to take into their employ any foreigner with a police record. The company will be furnished with a list of the same by the city and county authorities.

During the year 1907, 25 coal mines were worked in Africa. The gross tonnage produced 3,969,884 tons, valued at £796,361. The white men employed numbered 498, while there were 10,076 colored workmen. There were only 35 fatal accidents; 291,991 ft. of workings were driven, and 3089 ft. of shaft were sunk.

In plants worked by mechanical draft, an economizer is an important item, as the saving effected will pay the running expenses of the fan and the final temperature of the gases may be reduced considerably below what is necessary to maintain the chimney draft. It is possible to work with exit gases below 200 deg. Fahrenheit.

Pounding in a pump indicates that the pump chamber is not filling as it should. This defect may be overcome by an air chamber located on the section pipe near the boiler; this will induce a continuous flow of water to the suction valves and so remedy the trouble. Pounding is usually due to a defective suction pipe, though sometimes it is caused by defective valves or water lagging behind the plunger.

Efficient pipe lagging is all important in the prevention of condensation in steam pipes. Not only the barrel of the pipe, but the flanges also should be lagged. Leaky joints are often the result of pipes put up without proper provision for expansion. Good spring-bends, heavy flanges and thin joints which cannot blow out, will remove all cause for anxiety about the inconvenience of flange covers.

The manufacture of briquets from black grass meadow mud is an important industry of Russia and Holland. This mud is carboniferous in character, and is a lower vegetable deposit than peat. It is chiefly composed of vegetable matter, rotted under water, intermixed with earthy substances. But little preparation, aside from drying after leaving the briquetting machine is necessary to convert this mud into briquets.

Breathing appliances should be used with a considerable degree of caution. The explorer should have had ample experience before undertaking rescue work and should be thoroughly acquainted with the mine itself. Facts go to show that rescue work in a mine after a disaster is very uncertain and that rescue appliances, although excellent in themselves, may lead to further disaster when improperly used underground.

For a slow-speed engine, a receiver near the engine and small pipes with a high velocity of steam is more economical than large pipes; but with high-speed engines, the receiver is only a source of condensation and loss. Steam traps are used to deal with the condensation, and often add to the losses by heavy leakage. Do not bury them or hide them away where they cannot be seen, but treat them with suspicion and keep them under close observation.

The wear and tear on mechanical ash conveyers is great; for this reason, ash pits under boilers with a light railway, at a lower level, into which the ashes will run without much assistance is often a more economical arrangement than conveyers. In cases where elevators must be used, they should have few wearing parts and these should be lubricated with hard grease instead of oil, as the latter washes grit into the bearings while the former helps to squeeze it out.

The statement is made that soft coal is to take the place of anthracite in the freight service of the Lackawanna railroad. There will be no change in the passenger service, unless the company should change its present plans. The change will be made for economic reasons. The saving resulting from the use of bituminous coal will amount to thousands of dollars a year. Another reason favoring the change, is the claim of higher efficiency with soft coal, which makes a hotter and quicker fire. Bituminous coal has already been in use on the Buffalo division for several years.

During 1907 the death rate in the mines of New Mexico was 1.04 per cent., which compares with a rate of 0.0382 per cent. during 1906. This increase is credited mainly to carelessness on the part of the miners and the pernicious habit of shooting off the solid. The mines of the territory are quite dusty, and the principal danger to be guarded against is the explosion of this dust. The system of paying for run-of-mine coal instead of clean coal has led to the increase of shooting from the solid, which has greatly increased the number of fatal accidents resulting from dust explosions.

All engine bearings should be examined systematically; they should not be screwed up too tight as this increases the friction. If they are tightened in the morning before starting operations, when they are cold and contracted they are likely to be screwed up too tight. The best time for such examinations is right after work is finished for the day when they are expanded from the friction of working and are in their operating condition. Care should be taken to guard against the possible accumulation of dust as it increases friction. When undue friction exists in the bearings, examine the lubricant on them and you will find metallic particles in the oil.

Nothing will keep a plant and the working staff in such good order as periodical tests and the recording of data intelligently supervised. The educational value on the men, of single day full tests is great, as it emphasizes the importance of attention to small details. The workmen soon learn how to improve their methods and get the best value out of the plant. There is also the stimulant of healthy competition among the men on different shifts if they are tested under similar conditions and their work compared. Much could be learned and many improvements made if the working staff responsible for the management of a colliery knew more concerning the items which go to make up the working expenses.

Beech props are not used extensively in English mines owing to their weight, which exceeds that of most other timber. Such props when employed are generally used in return airways as they stand the weathering effect of the air current well. Pitch pine is used for supporting the roof and sides in wet places. It is of a resinous character and extremely durable in wet places, but cannot be used with a large margin of safety anywhere else as it burns quickly and is therefore dangerous. Oak is the timber of permanence and durability and is used for main roads or in any place where permanence is required and where the pressure is great. Roads timbered with oak have been known to last over 50 years. It is the most durable timber and stands weathering well.

THE ENGINEERING AND MINING JOURNAL
Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec'y.
505 Pearl Street, New York.
London Office: 6 Bouverie Street, London, E. C., Eng.
CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

CIRCULATION STATEMENT

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for June, 1908, was 41,000 copies.

July 4 16,000
July 11 9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

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The Copper Market

About a fortnight ago the copper market, which previously had been dull, developed weakness, owing to the desire to sell on the part of some producers whose nerves were unable to stand the strain. However, on the decline, domestic consumers manifested more interest than for a long time previously, and considerable purchases were made by them, especially at 12½c. for electrolytic. At that point there were found to be a good many inquiries in the market, with the probability that a small further concession would bring about very large business. American manufacturers appeared to be, indeed, in the frame of mind that the Europeans were in last November, when they realized that the price for copper was low and appreciated the advantage of providing for future requirements, even if the latter were not immediately in sight.

American manufacturers also recognized that copper was cheap at that time, but they did not have the money to invest. Since then, nearly nine months have elapsed. The supply of money has become abundant. Business is showing some signs of improvement. Confidence is being gradually restored. Consequently, it is the part of wisdom for American manufacturers to provide for their future requirements of copper. Under these circumstances, it was perfectly natural that there should be some recovery in the price for copper as has been experienced during the past week.

Dry Air Blast in Steel Making

The Gayley dry-air blast system, as is well known, has been used with marked success at several blast furnaces during the last three years. Recently a series of tests was undertaken at the South Chicago works of the Illinois Steel Company, the object being to prove the inventor's belief that the dry blast would be equally beneficial in connection with the bessemer converter. The dry-air plant already constructed for the South Chicago blast furnace was used, and a run of two days was made, the average reduction of moisture in the air blown into the converters being from 5.98 to 1.39 grains of moisture per cubic foot.

The results obtained were so remarkable that so high an authority as P. H. Dudley, who tested the ingots and rails produced, feels justified in speaking of the test as "of technical and historical importance. . . . A great step in advance for the bessemer process from every standpoint of consideration and practical operation." The results obtained with the dry blast were encouraging in the direction of increased capacity for carrying scrap, and other items bearing on cost; the enlarged control of high or low silicon irons; the most significant, however, being the great improvement in the product, as shown by Mr. Dudley's test. The ingots cast from steel made with the dry blast were more solid, free from blowholes, except at the extreme top, and the blooms made from them showed unusual solidity and freedom from segregation. Throughout the test a better and more nearly uniform grade of steel was apparent. The blooms were used, with only the usual discard, in rolling 100-lb. section steel rails; and in careful tests of these rails only 1 per cent. were rejected as defective or of second quality. This is a very unusual proportion.

The results thus shown may be of great importance in restoring confidence in the bessemer process, and putting the converters again on a parity with the open-hearth furnaces as far as the quality of the product is concerned. The test was on such a scale and so carefully made that it may be accepted as fully confirming Mr. Gayley's claims for the advantages of using dry air in the converter as well as in the blast furnace. It is not impossible that in this application may be found the solution of the steel-rail question, over which there has been so much controversy during the past two years. If parallel results can be secured in continuous operation—and there is no apparent reason why they cannot—there will be no necessity of abandoning the bessemer converter and resorting to the open-hearth furnace for rail-making metal.

Years ago Dr. William B. Phillips predicted that the next great improvement in iron making would be in the drying of the blast. He was not able to find supporters, or to carry out his ideas into practice at the time; and it was reserved for Mr. Gayley to devise the method of drying the air, and to test it on a scale which has demonstrated the technical and commercial value of the improvement.

Cadmium as a By-product

Some of the producers of zinc ore in the Joplin district have discovered that their ore contains considerable cadmium, sometimes upward of 0.5 per cent., and as a local newspaper puts it, "The producer receives no extra money for his cadmium, although in many instances its value will be more than $10 to the ton of zinc." Certain of the mine operators have suggested that there be some method of receiving pay for this by-product. We fear that they are doomed to disappointment in this respect.

It is quite true that the Joplin blende contains a comparatively high percentage of cadmium, indeed more than we know of in any other ore produced in large quantities, but unfortunately the uses of cadmium are few. The production of metallic cadmium in 1907 was about 70,550 lb. in Silesia and about 15,000 lb. in the United States; this represents the world's production.

Although under present conditions cadmium fetches a high price, its value in the United States being $1.25 per lb., it is one of the substances in limited demand for which a high value is maintained only so long as the production is small. The inauguration of competition in such industries invariably leads to a tumble in price that is disconcerting and dispelling of fond hopes of immense profits. Recent experiences in the production of bismuth, cobalt oxide, lithia and other substances are illuminating in this respect.

At present radium is perhaps the most precious of substances, but its extraordinary value is decreed by the fact that the world's supply in marketable form is scarcely a spoonful. If some one should be able to supply a cupful there would probably be a *debacle* in radium.

With respect to cadmium, the amount that can be recovered as metal is only a tithe of what exists in the ore. But even so, the present producers could furnish a vastly greater quantity if they could sell it, and moreover the smelters of silver-lead ore could also furnish it.

The producer of zinc ore is not refused anything to which he is entitled when he is not paid for the cadmium in his ore. On the contrary the smelter is a good deal more likely to object to its presence. He has to be constantly on his guard to avoid paying for cadmium as zinc, because with the careless chemist cadmium may be reckoned as zinc in the assay; and, moreover, a considerable portion of the cadmium goes into the spelter, to which some consumers of spelter object; unreasonably we think, but still they do object.

Alexander L. Agassiz

In his recent examination in connection with the trial of the suit of A. S. Bigelow against the Calumet & Hecla Mining Company, Alexander L. Agassiz, president of the Calumet & Hecla, became righteously indignant and said: "I have served the Calumet & Hecla Mining Company from the beginning; I have been perhaps an autocrat in running it. But I defy anyone to find anything in my conduct which will in any way show that I have benefited in the least at the expense of any of the other stockholders. If working tooth and nail for 40 years means anything, all I can say is that it is not worth the while of anybody to work, if what I have done is subject to the attacks such as I have been subjected to during the last six months."

Mr. Agassiz has had so many reasons for feeling irritated under the wild charges made in connection with this litigation that he will readily be forgiven for displaying some indignation. However, he can rest easy with the assurance that everyone in the mining industry whose opinion is valuable recognizes the great work that he has done in building up the Calumet & Hecla Mining Company, and any ordinarily well informed person knows what has been the position of the Calumet & Hecla in the copper trade and marvels at the ridiculousness of the charge that it has been attempting to create a trust. On the contrary, the Calumet & Hecla has ever been the great exponent of the open market, and as such has been the champion iconoclast of the trusts.

The Eight-hour Day in British Coal Mines

The Eight Hours Bill for limiting the working hours of coal miners in Great Britain is now being discussed by Parliament. As to the necessity of the bill there is considerable difference of opinion. It is recognized that if it is passed the cost of production will be increased and that prices will rise, which will have a serious effect on the iron and steel and other industries. Practical men, such as the chairman of Pease & Partners, one of the large coal and iron companies of the north of England, complain of the interference of government departments and of the expense and waste of time in making complicated returns. If this bill is passed, clerical work of this nature will be still further increased. The evidence brought forward to show that the hours of miners are already too severe is not weighty. It is well known that colliers do not always work six days a week. At the collieries of Pease & Partners every Saturday and Monday there are 20 to 30 per cent. of the miners idle. For the eight weeks ended Sept. 28, 1907, the average time lost was 24.19 per cent. of that which would have been made if the men employed in the mine had worked full time. The causes of the loss of time were 17.4 per cent. simply idle, 3.17 off through illness, and 3.62 per cent. off through accidents.

That the bill as it stands is likely to have a far-reaching effect on the industries of Great Britain, appears to be causing alarm to the government, and important amendments modifying the hours of labor and postponing the operation of the measure have already been accepted.

Gold Mining Prospects in California

The unusual scarcity of water this season, which is due to the light snowfall on the Sierra Nevada last winter, will probably cause an early closing of all the mines along the Mother Lode in California this season. The mining situation will be the dullest in several seasons because of this lack of water at the mines. The scarcity will affect the mines as far south as Tuolumne county. In that county the ditch and power men think that they will be able to supply water up to September, but hardly expect to do so beyond that time, until the winter rains come. Therefore many of the mines expect to close for a while in about three months from now.

THE RECENT formation of several new associations, intended mainly for the discussion of coal-mining methods and of means for the prevention of accidents, cannot fail to be productive of good results. The interchange of experiences and the discussion of local methods will broaden the views of managers and lead to the adoption of many improvements.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Canadian Mining Institute

There were several mistakes in the account of the meeting of the western branch of the Canadian Mining Institute, held at Rossland, B. C., on May 14, as published in the JOURNAL of June 20, which I shall esteem it a favor to be permitted to correct.

When I was at the Tyee Copper Company's smelter, Ladysmith, Vancouver Island, a few weeks prior to the meeting, the manager, W. J. Watson, was good enough to explain to me the advantages he was obtaining in using a matte separating forehearth, which was his own adaptation of the old Orford settler to a water-jacket receiver. My notes, read at our meeting, were to the effect that among other advantages afforded by the use of this matte separator are the elimination of danger of men being burned when tapping, the much cleaner slag made (this causing a saving which in one month more than pays the cost of installation), the economy effected in the services of a tapper being dispensed with in each of the three shifts, the reduction in the wear and tear of matte pots (the stream of matte not striking the side of the pot as in the ordinary tapping operation), and in the saving of tapping-clay. A photograph and blue prints of drawings illustrated this subject.

Next, in connection with C. M. Campbell's excellent paper on "Granby Mining Methods," the Granby mines up to the time of the meeting had not produced "over 5,000,000 tons of ore," as stated in the JOURNAL. These figures are about 1,000,000 tons in excess of the actual production, and they do not appear in the carbon copy of Mr. Campbell's paper supplied to the secretary. Neither do I find any statement to the effect that in one place the ledge, measured horizontally, is 700 ft. in width. Mr. Campbell did state, however, that "at the place where this section is taken a crosscut could be started in ore at the footwall and driven for over 600 ft. before again encountering waste rock."

Then, the gold medal presented to Frank E. Lathe was not given by the institute, but by last year's president. As that gentleman, Frederic Keeffer, was prevented by important business from attending the meeting, he sent the medal to the president of the branch, A. B. W. Hodges, and requested him to take advantage of Mr. Lathe's presence at the meeting to publicly present him with the medal, which was for the best paper submitted by a student last year. Incidentally I would like to add that the judges of the students' papers described Mr. Lathe's paper as "an excellent monograph, carefully written, with full attention to details, and especially to the costs and expenses of manufacture; a point in which many technical papers are deficient."

Finally, the paragraph in the JOURNAL relative to my reading "a paper from notes by Mr. Miller of the Tyee smelter," is also incorrect. What I did read was a few notes I made on "Ore Hoisting Appliances at the Tyee Copper Company's Smelter," which I also obtained when visiting the works. In particular I described a trolley designed by Mr. Watson, the manager, which has been found to work effectively in hoisting ore from vessels into bunkers on the wharf at Ladysmith. Photographs and blueprints of drawings were kindly supplied by Mr. Watson at my request, to better show the devices I endeavored to describe.

E. JACOBS,
Sec'y Western Branch of C. M. I.
Victoria, B. C., June 25, 1908.

Facts Concerning Cardiff Mine Explosion

In the communication of H. N. Dodge in the JOURNAL of May 23, regarding mine explosions, I was surprised to see certain statements relating to the explosion at Cardiff, Ill., several years ago. Noting in the JOURNAL of June 6 that another correspondent refers to this subject I think it is important that such statements, upon which theories are liable to be built, should be quite exact. I, therefore, wish to correct Mr. Dodge when he states that no gas had been found before the explosion. Assuming the usual meaning of "gas" in mining parlance, to be marsh gas either pure or diluted, to my personal knowledge, several "feeders" had been found. As Mr. Dodge was night foreman at the time of the explosion, I think he will need only a spur to his memory to recall at least one feeder which was ready to light on all occasions, issuing in a small jet from the floor at the mouth of one of the rooms near the seat of the trouble.

Whether or not marsh gas had any effect in the first explosion is a matter I am not prepared to state; briefly, the origin of the trouble was this: A section of the mine had been temporarily abandoned, to be reopened to pull pillars at a later period. Meantime it was being ventilated and supposedly examined daily. The facts that developed were, that a heavy fall of roof in a room in a thick upper seam dropped on to the floor, knocking a hole in this through strata about 6 ft. thick into workings of a lower seam. There was a little water standing in this room and when the "soapstone" of the upper seam roof came in contact with it spontaneous combustion set in. When discovered the gob fire was burning so fiercely, having set fire to the coal in the pile, that the local management concluded they could not put it out by direct means and undertook to brattice off the whole district. Before this was completed an explosion occurred blowing out the stoppings. An attempt was made to flood the seat of the fire and at the same time to re-erect brattices across the return airways. This work was never finished, successive explosions covering several days causing the loss of nine men in all, wrecking the mine and setting fire to it. The hoisting shaft lining burned out and allowed quicksand to run in. This in turn pulled the steel tower down into a hopeless tangle.

The lesson to be learned from this heavy loss is, unceasing vigilance in inspection of old workings and prompt action at the immediate seat of fire, first trying to put it out by direct means and, if the mine makes gas, using brattices with great caution. If brattices have to be erected they should be placed as close to the fire as possible on the return side first.

GEO. S. RICE.
Chicago, Ill., July 2, 1908.

Mining Supplies

There are a few classes of supplies which all mines use, upon which little information is obtainable, except that furnished by selling agents. This is all right, so far as it goes, except that each contradicts all the others. I refer particularly to drill steel, lubricants, packing for pumps, engines, air and steam pipe, and compound for lubricating and preservation of hoisting ropes. In visiting mines, one sees a different variety in use at each one. The master mechanic always swears by his particular brand and condemns all the others, which, of course, he has tried and found worthless. Conditions vary somewhat, but there must be

information floating around, if it could only be corralled, which would save a great deal of the experimenting, which is now done each man for himself. The conditions vary, as I have said, but the principles must remain largely the same. Engines are a good deal alike and must be lubricated. Steam only varies in pressure and temperature.

I am particularly interested in the question of rope compounds. There must be some best lubricant for the inside wires of a hoisting rope. Can it be combined in varying proportion with the best material for resisting water more or less acid, or must some other ingredient be combined to get the maximum result? Not the greatest length in the life of the ropes necessarily, but the best results for the money expended; balancing the cost of the rope against that of the compound and the expense of applying it.

The cost of compound made by the manufacturers is very high. When salesmen insist on taking your order for a large trial shipment, at prices ranging from 10 to 35c. per lb. f.o.b. the factory, nothing to be paid unless its use is successful (that is, unless it proves more economical than the brand in use, whatever it may be), I am forced to the conclusion that there is considerable profit in its manufacture. This is a subject on which I desire information. If anyone has definitue figures on the cost of the ropes as affected by using different compounds, it would be distinctly a gift to the profession to make them public, and in my case would save wasting time and money in trying some brands. The cost of rope and compound is a small charge against a ton of rock hoisted, but in a large mine it amounts to a considerable sum in a year, and as such commands attention.

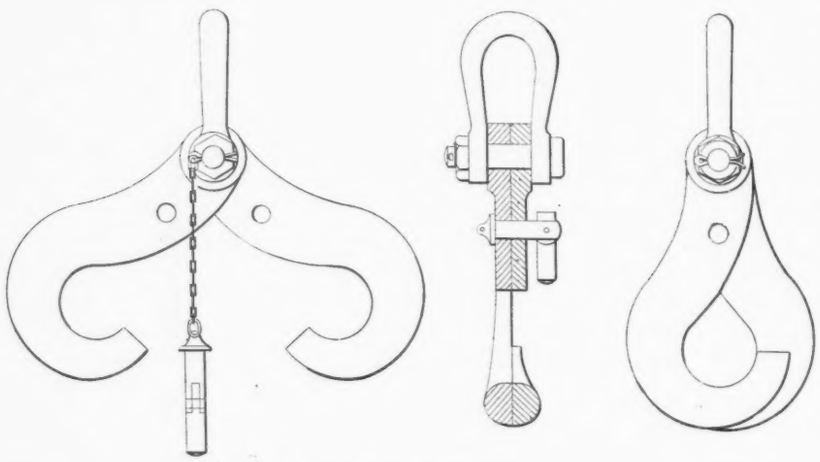
G. T. B.

Globe, Ariz., June 27, 1908.

The bulk of the tungsten ore produced in the United States comes from Colorado.

Safety Sinking Hook

I have read with interest in the JOURNAL of April 18 the paper by Henry Louis on "Safety Sinking Hooks." I should like to add to the illustrations already given another sketch showing a hook which was designed by myself for Wheal Kitty and Penhalls United, Ltd., and which gave every satisfaction in shaft sinking. It has no springs or other delicate parts to get out of order. It is impossible for the bucket to drop off the hook. It is easily attached and detached, and is so simple that it can be made by any ordinary smith. In my opinion this hook is superior to any of those illustrated by Mr. Louis.



PRISK'S WINDING HOOK

THOS. H. PRISK.

St. Agnes, Cornwall, May 20, 1908.

Production of Mica in North Carolina

BY JOSEPH HYDE PRATT*

There still continues to be a large demand for North Carolina mica, and during 1907 there was a slight increase in the production over that of the previous year. The production[1] for 1907 amounted to 645,221 lb. of sheet mica valued at $209,956. Besides this, there were 1371 tons of scrap mica produced, valued at $15,250. As can be judged from the ratio of the price to the pounds produced, a large proportion of the North Carolina mica was of comparatively large sheets, some of which were valued at $3 or more per pound. This production was obtained from nine counties in the western part of the State.

*State geologist, Chapel Hill, N. C.

[1]These statistics were collected by the U. S. Geological Survey and the North Carolina Geological and Economic Survey in coöperation.

Reform in the Comstock Mining Companies

SPECIAL CORRESPONDENCE

F. B. Sturgis, Pennsylvania coal-mine operator, who recently secured controlling interests in several of the old Comstock Lode, Nevada, mines, has stirred things up in the offices of those companies in San Francisco. He suggested that the mines were run on a "top-heavy" system, and that salaries of office forces should be largely reduced. This proposition has met with the unanimous approval of the directors of the several companies affected and the following adopted the recommendations: Alpha, Andes, Sierra Nevada, Union, Consolidated, Ophir, Mexican, Consolidated California & Virginia, Savage, Chollar, Potosi, Gould & Curry, Bullion, Julia and Exchequer. In most cases the salaries of the presidents and secretaries have been cut in half. After three months the positions of assistant secretaries are to be abolished. All supplies will hereafter be purchased under contract from the lowest bidder. Auditing committees on each directorate will pass on all expenditures. The cut in salaries alone will total an annual saving of $55,000. Sturgis is now attempting to secure a reduction in the water rates from the Gold Hill & Virginia City Water Company, whose revenue from the Comstock mines for supplying them with water, is reported to be not less than $1,000,000 per annum.

It is notorious that a number of the Comstock companies have been run for a long time for the benefit of the official staff, deficiencies being made good by assessments on the stockholders. Mr. Sturgis has, apparently, taken hold in the expectation of making money by mining, and expects that most of his costs will be made at the mines, and not in the offices.

Gold Stealing in Western Australia

Gold stealing in Western Australia has been greatly reduced since the authorities endeavored seriously to put a stop to it. The returns of gold production furnished to the Mines Department and the amount of gold sold to the mint or entered for export from the State, showed a difference of £485,000 in 1905. In 1906, when the Gold Stealing Commission instituted inquiries the difference was £247,437. In 1907, when the new laws were enforced and special detectives were employed at the cost of the mines, the difference was only £104,327.

The production of iron ore in Japan in 1906 was 40,766 tons; of iron pyrites, 42,155 tons.

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

Market for Infusorial Earth

I am endeavoring to find a market for the product of my infusorial earth mine. The material is high grade and I am desirous of securing the names of the firms who are in the market for it.

A. B. L.

We suggest that you correspond with W. H. Whittaker, 245 Front street, New York City, or Hammill & Gillespie, 240 Front street, New York City.

Barium Carbonate

Please give me the names of reliable wholesale establishments that can furnish barium carbonate, precipitated, 98 per cent. pure, in large quantities.

H. O. E.

Gabriel & Schall, 205 Pearl street, New York City, make a specialty of all barium products. Hammill & Gillespie, 240 Front street, New York City, and John C. Wiarda, 259 Greenpoint avenue, Brooklyn, N. Y., also handle barium products.

Market for Tungsten Ore

Is there any custom concentrator for tungsten ore in Pittsburg, Penn., ready to treat or purchase the crude ore? What concerns are interested in the purchase of tungsten concentrate?

F. T.

Henry E. Wood & Co., Denver, Colo., buy crude tungsten ore for concentration. The Primos Chemical Company, of Primos, Delaware county, Penn., is a purchaser of tungsten concentrate.

Value of Arsenic Ore

What is the market for mispickel ore carrying from $6 to $30 per ton in gold? I have communicated with the smelter at Everett, Wash., but find it will not pay for the arsenic.

W. A. H.

The only concerns in the United States which recover arsenic from ores are the Puget Sound Reduction Company, of Everett, Wash., and the Anaconda Copper Mining Company, of Anaconda, Mont. In Canada the Deloro Mining and Reduction Company, of Deloro, Ont., treats arsenical gold ore and produces white arsenic.

The fact that the smelter at Everett will not openly pay for the arsenic as such does not imply necessarily that no payment is made. Payment may be made in the form of a lower treatment charge than otherwise would be demanded, which, of course, is equivalent to an allowance for the arsenic, although it does not appear as such on the face of the returns. We know that certain shippers of arsenical ore to the Everett works obtain in this way an allowance for the arsenic value of their ore.

Generally speaking, a smelter which is equipped for recovery of arsenic as a by-product can afford to pay about one-third of the market price of white arsenic for the arsenic content of the ore in excess of 10 per cent. For example, if the price for white arsenic is 3c. per lb., an ore assaying 30 per cent. arsenic would be worth $20 \times (30 - 10) \times \$0.01 = \$4$. This basis of payment leaves a fair margin for profit to the smelter, but, of course, as pointed out above, the arsenic value may be paid for in the form of a reduced treatment charge.

Market for Ozokerite

I am in a position to furnish the best quality of ozokerite in quantity and should like to know where I could find a market for the material. I should also like to know how much ozokerite is imported into the United States, and how it is packed for shipment. A. K. S.

Ozokerite is produced chiefly in Austria, where the industry is controlled by a trust. The production in the United States is practically nil, Colorado and Utah producing small amounts which, however, is probably not all true ozokerite. The total imports of all waxes into the United States is about 8,000,000 lb. per annum, and of this quantity it is estimated that true ozokerite consists of 25 per cent. Ozokerite is used chiefly for mixing with waxes for the purpose of hardening them; and as an insulating material for wire cable. The best grades of true ozokerite are worth about 17c. per lb. to the consumer; the price grades down to 10c. per lb. for the poorer qualities. If you have the true ozokerite you will doubtless find a market for it in this country, for the demand is good. Messrs. Stanley Jordan & Co., 100 William street, New York, and John S. Lamson & Brother, Maiden Lane and William street, New York, are dealers in this material, and we suggest that you send them each a 1-lb. sample, representing the average grade. The material is packed in bags for shipment.

Cryolite

What are the uses for cryolite and what is its value? J. J.

Cryolite is used in the manufacture of sodium salts, the manufacture of certain special kinds of porcelain and glass, and as a flux in aluminum smelting. For the last purpose, however, the demand has lately been greatly diminshed by the substitution of a product derived from fluorspar. By far the major portion of the cryolite imported into the United States is employed for the manufacture of sodium salts. The business is entirely in the hands of the Pennsylvania Salt Manufacturing Company, of Natrona, Penn. The average value of the cryolite imported into the United States in 1904 was $14.30 per 2240 lb.; in 1905, $14.05; in 1906, $19.72; and in 1907, $22.51.

Use and Value of Magnesite

What is the composition of commercial magnesite? How much carbon dioxide will it yield? What is the value of liquid carbon dioxide? In burning magnesite, how much residue remains in the kiln? What percentage of fuel is required? What is the value of calcined magnesite?

W. I.

Magnesite should be high in magnesium carbonate. The commercial mineral frequently contains as much as 98 per cent. In burning a charge of 90 per cent. of high-grade magnesite mixed with 10 per cent. coke, 50 per cent. of the weight of the magnesite is obtained in the form of carbon dioxide. The price of liquid dioxide depends upon the use to which it is to be put, the maximum price being about 10c. per lb. However, the price is very variable and must be determined by negotiation. About 48 per cent. of the weight of the magnesite remains as residue in the kiln, plus the weight of the ash of the coal or coke used. Coal or coke may be used as fuel. In the case of coke, the requirement is about 10 to 12 per cent. of the weight of the magnesite. The value of calcined magnesite is $14 to $15 per 2000 pounds.

Price of Gypsum

What is the market price of gypsum, and who are dealers in this material?

S. L. L.

Ground gypsum is quoted at $4@7 per short ton, f.o.b. New York. J. B. King & Co., 1 Broadway, New York City, is a dealer in ground gypsum. The U. S. Gypsum Company, 1123 Broadway, New York City, is the largest miner of gypsum in the United States.

Loss of Vanadium

Is there any loss of vanadium in the manufacture of ferro-vanadium from ferrous vanadate?

A. H. H.

This is a subject on which there are only one or two authorities in this country; little of value has been published regarding it. In processes of this kind there are inevitable losses. In this particular case, the loss would depend on the character of the vanadate, the kind of alloy desired, the type and intensity of the furnace used, and many other things.

A consular report from Calcutta states that the Burma Oil Company, of Rangoon, inaugurated on April 12 a new pipe line for transporting oil from the Yenangyaung oilfields to the pumping station at Pyinbinhla, 25 miles above Prome. The section is now opened in the northernmost part of the line, which in future will feed Rangoon refineries.

New Publications

POWER GAS PRODUCERS, THEIR DESIGN AND APPLICATION. By Philip W. Robson. Pp. 247, illustrated. 5¾x8¾ in.; cloth, 10s. 6d., London, 1908: Edward Arnold.

THE PRINCIPLES OF MECHANICS FOR STUDENTS OF PHYSICS AND ENGINEERING. By Henry Crew. Pp. 295, illustrated. 5¼x8¼ in.; cloth. New York, 1908: Longmans, Green & Co.

THE TELKWA RIVER AND VICINITY, B. C. By W. W. Leach. Geological Survey of Canada. Pp. 23, 1 map. 6½x9½ in.; paper. Ottawa, 1907: Government Printing Bureau.

SUMMARY REPORT OF THE GEOLOGICAL SURVEY DEPARTMENT OF CANADA FOR THE CALENDAR YEAR 1906. Pp. 206. 6½x9½ in.; paper. Ottawa, 1906: Printed by S. E. Dawson.

ILLINOIS STATE GEOLOGICAL SURVEY, BULLETIN No. 4. Year-Book for 1906. H. Foster Bain, Director. Pp. 260, illustrated. 5¾x8¾ in.; cloth; Urbana, 1907: University of Illinois.

BINDERS FOR COAL BRIQUETS. Investigations made at the Fuel-testing Plant, St. Louis, Mo. By James E. Mills. U. S. Geological Survey, Bull. No. 343. Pp. 56. 5¾x9 in.; paper, Washington, 1908: Government Printing Office.

ANNUAL REPORT, GEOLOGICAL SURVEY OF CANADA, 1904. Vol. XVI. (New Series) Reports A, B, C, CC, G, H and S. Illustrated, including maps in separate cover. 6½x9¾ in.; cloth. Ottawa, 1906: Printed by S. E. Dawson.

GEOLOGY AND MINERAL RESOURCES OF THE CONTROLLER BAY REGION, ALASKA. By G. C. Martin. U. S. Geological Survey. Bull. No. 335. Pp. 141, illustrated, including maps. 5¾x9 in.; paper. Washington, 1908: Government Printing Office.

PHYSICAL GEOGRAPHY OF THE EVANSTON-WAUKEGAN REGION. By Wallace W. Atwood and James Walter Goldthwait. Illinois State Geological Survey, Bulletin No. 7. Pp. 102, illustrated. 6x9 in.; cloth. Urbana, 1908: University of Illinois.

UEBERSICHT UEBER DIE NUTZBAREN LANGERSTAETTEN SUEDAFRIKAS. By Dr. F. W. Voit, Sonderabdruck aus "Zeitschrift für Praktische Geologie." XVI, Jahrgang, 1908, Heft 4 and 5. Pp. 38, illustrated. 7½x10½ in.; paper. Berlin, 1908: Max Krahmann.

THE CERATOPSIA. By John B. Hatcher, based on preliminary studies by O. C. Marsh. Edited and completed by Richard S. Lull, U. S. Geological Survey, Monograph XLIX. Pp. 294, illustrated. 9x11¾ in.; cloth. Washington, 1907: Government Printing Office.

THE DESIGN OF TYPICAL STEEL RAILWAY BRIDGES. An Elementary Course for Engineering Students and Draftsmen. By W. Chase Thomson. Pp. 178, illustrated. 6x9¼ in.; cloth. New York and London, 1908: The Engineering News Publishing Company.

REPORT ON A PORTION OF NORTHWESTERN ONTARIO TRAVERSED BY THE NATIONAL TRANSCONTINENTAL RAILWAY BETWEEN LAKE NIPIGON AND STURGEON LAKE. By W. H. Collins. Pp. 23, 1 map, illustrated. 6½x9¾ in.; paper. Ottawa, 1908: Canada Department of Mines, Geological Survey Branch.

THE FALLS OF NIAGARA. THEIR EVOLUTION AND VARYING RELATIONS TO THE GREAT LAKES; CHARACTERISTICS OF THE POWER, AND THE EFFECTS OF ITS DIVERSION. By Joseph William Winthrop Spencer. Pp. 490, 2 maps, illustrated. 6½x9¾ in.; paper. Ottawa, 1907: Canada Department of Mines, Geological Survey Branch.

THE FAIRBANKS AND RAMPART QUADRANGLES YUKON-TANANA REGION, ALASKA. By L. M. Prindle, with a Section on the Rampart Placers. By F. L. Hess, and a Paper on the Water Supply of the Fairbanks Region. By C. C. Covert. U. S. Geological Survey, Bull. No. 337. Pp. 102, illustrated, including maps. 5¾x9 in.; paper. Washington, 1908: Government Printing Office.

MINES AND MINERALS OF THE BRITISH EMPIRE. By Ralph Stokes. Pp. 403; illustrated. 5½x8½; cloth, 15s. London, 1908: Edward Arnold.

The author was formerly mining editor of the *Rand Daily Mail*, of Johannesburg. His book is the account of his travels among the important mining districts of the British Empire, during which he visited nearly all of them. The reader is bound to admire his industry in pursuing his subject. His observation was keen and his description and analysis of what he saw are intelligent. The work that he assigned to himself was well done, and his book is not only interesting to read, but also is a valuable contribution to knowledge.

RECORD OF THE MINES OF SOUTH AUSTRALIA. Fourth Edition. H. Y. L. Brown, Government Geologist. Pp. 382. 6x9¾ in.; paper. Adelaide, 1908: C. E. Bristow, Government Printer.

Contents: A short account of the chief geological features of the State of South Australia. Early history of South Australian Mining. Copper. Silver-Lead. Gold. Iron. Mineral Phosphates. Brown coal, lignite, etc. Manganese. Miscellaneous. Gems and rare minerals. Metallic minerals, earthy minerals of economic importance, and gems (chief localities). Return of Annual Mineral Production since 1840. Index. Map, showing approximate area occupied by metal-bearing rocks.

THE ARCHITECT'S AND BUILDER'S POCKET-BOOK. By Frank E. Kidder. Pp. 161, illustrated. 4¼x7 in.; leather, $5. New York, 1908: John Wiley & Sons.

This is the fifteenth edition of the well known pocket-book which among architects and builders ranks as Trautwine and Kent do among engineers. The changes in the new edition consist of the correction of typographical errors and the rewriting of the chapters on "Fireproofing of Buildings" and "Reinforced Concrete." This work has been done by Rudolph P. Miller, who was for 10 years connected with the Department of Building, New York City, and for the last five years as its chief engineer. At the time of Mr. Kidder's revision for the 14th edition, he was not satisfied with these chapters, and would have revised them personally if he had lived.

LEHRBUCH DER BERGBAUKUNDE MIT BESONDERER BERUECKSICHTIGUNG DES STEINKOHLENBERGBAUS. Erster Band. By F. Heise and F. Herbst. Pp. 604, illustrated. 6¼x9¼ in.; cloth. Price, 11 marks. Berlin, 1908: Julius Springer.

Even to enumerate the contents of this work would require a column of our space. It will be sufficient to say that it is the latest among the monumental books dealing with the art of mining, of which those of Goupilliere, Köhler and LeNeve Foster are illustrious predecessors. Professor Heise is director of the mining school at Bochum, while Mr. Herbst is professor in the well known technical high school at Aachen. Thus they are well equipped for the subject which they have undertaken. This first volume relates chiefly to coal mining; the authors hope that they will be able to publish the second volume before the lapse of two years.

Such criticisms as we might be disposed to make respecting the volume before us are disarmed by the disclaimers of the authors. Their work is distinctly intended for the use of the student in school, rather than for the technical man in practice; and they have limited their discussion of methods to those which are employed in Germany. However, these limitations will not prevent the book from receiving the appreciation to which it is entitled among technologists, to whom it will be valuable as well as to the students, and it is bound to take rank among the classics of engineering literature.

The manner in which the book is published, including typography, printing, binding and its noteworthy engravings, is of an excellence that excites our admiration, and last, but not least, the book is provided with a comprehensive index.

Lake Superior Mining Institute

SPECIAL CORRESPONDENCE

The thirteenth annual session of the Lake Superior Mining Institute, held last week on the Minnesota ranges, was one of the best meetings ever held by that organization. Not only was there a larger and more representative attendance than usual, but the trips taken were of greater interest in that there were more new things to see. Those who attended the Minnesota meeting of the American Institute of Mining Engineers, four years ago, will recollect the admirable program then carried out, and the comfort of the special trains (veritable traveling hotels) then used. The program for this year, and the arrangement of special trains for three days were similar, only possibly more complete than those of four years ago. The party, leaving Duluth on Wednesday night, traveled in two trains. The two Minnesota ranges were traversed from the east end of the Vermilion range, at Ely, to the west end of the Mesabi range operations, at Coleraine; the entire distance from and to Duluth was 450 miles.

BUSINESS MEETING

The business meeting of the institute was held at Hibbing, in the new high school which contains a splendid auditorium capable of seating 700 persons. The following officers were elected for the ensuing year: President, M. M. Duncan, of the Cleveland Cliffs Iron Company, Marquette range; vice-presidents, W. J. Richards, of Corrigan, McKinney & Co., Crystal Falls, and Chas. Trezona, general superintendent of Vermilion range mines for the Oliver Iron Mining Company; managers, T. E. Keese, Ishpeming; W. J. Uren, Calumet; L. M. Hardenburg, Hurley; treasurer, E. W. Hopkins, Commonwealth; and secretary, A J. Yungbluth, Ishpeming; the latter two were re-elected, and the choice was a tribute to the two men who have served long and well in their respective positions. The election of Mr. Duncan foreshadows a meeting next year on the Marquette range. Seventy-two applications for membership were favorably considered, bringing the active membership to 547; the treasury balance showed $4670 on hand. About 240 members participated in the trip, while 40 or 50 more joined the party at points en route.

In the course of his presidential address, delivered at Virginia, Minn., President T. F. Cole referred to the brightening outlook for the metals, especially iron and copper, in which the members of the institute are particularly interested. He spoke of the conservation of natural resources, not alone in the saving of what materials we are using but in the utilization of others that lie about us, referring to the water power of the St. Louis river near Duluth, which when fully utilized, will be equivalent to the consumption of 1,300,000 tons of coal annually. This power the institute had visited the preceding day. He referred to the time when mining companies would be compelled to use steel for mine supports, and said that the Oliver company was even now considering the use of steel in main lateral openings, and is already using it in shafts. He outlined the future of the new Minnesota works of the United States Steel Corporation, stating that there was every reason to expect that this plant would supply all the steel-consuming territory lying west of the Great Lakes and north of a line, between Duluth and, say, Denver, insofar as that territory could be supplied by steel from Lake Superior ores. To include all this region, there were needed but a few short railway links to connect nearby points and give the proper rates.

Of the trip on the Vermilion range it is unnecessary to speak, other than to mention the steel shafthouses, four of them about 165 ft. high extending over a distance of little more than a mile. This gives an idea of the importance of the orebodies beneath. These were inspected and also the three Sullivan automatic hoists at the Pioneer, Zenith and Savoy-Sibley power houses. At Vermilion lake the geologically inclined among the party examined some of the most notable exposures of folded jaspers and dioritic intrusions to be seen anywhere, and discussed with some acidity the meaning, origin and necessity of the word "taconite" as adopted by the Minnesota survey for the jaspilite of the Mesabi range.

At the Norman mine, Virginia, the party was interested in the problems arising from the stripping of a caved underground mine, in which the work had been done so long ago that the underground workings were wrecked. The rooms, drifts, winzes and crosscuts had filled solidly with earth and boulders. Steam shovels, operating on supposedly solid ground might, in a moment, disappear from sight in some old working. The cost of taking out the old surface is estimated to be eight or nine times as great as would have been the case if there had been no prior openings. Notwithstanding this, there has been removed from the Norman surface in the last twelve months about 1,000,000 cu.yd. of overburden, averaging 35 ft. thick, and the property is expected to produce in the next three years as near 6,000,000 tons as is possible, on account of the expiration of the lease. The change from underground to open-pit methods was brought to the attention of the members even more sharply on the following day, at the great Monroe-Tener mine, near Hibbing. This property, containing some 45,000,000 tons of ore, was planned as a milling pit, only four years ago, after elaborate and extensive exploration and a very thorough study of the situation, as it then existed. A large area was opened to ore, lying at a depth of 75 to 90 ft. beneath the soil. Three steel shafts were sunk, extensive and elaborate laterals were run into the ore, many mills were raised to surface, a complete underground electric haulage plant was installed, and all was made ready for a product of two million or more tons per year. Aside from the stripping, all this is to be abandoned, the shaft houses removed, the tramming system taken away, and a long surface approach is to be constructed for steam-shovel mining. Even the milling system is too slow, and a mile-long approach is to be cut to enable locomotives to pull trains of ore out of this enormous pit.

At Mountain Iron the chief attraction was the Oliver Iron Mining Company's clubhouse, open to its employees and all citizens, and without doubt the most comfortable, convenient and well arranged clubhouse in any town of its size.

TREATMENT OF SANDY ORES

Saturday was spent at Coleraine, where the Oliver company is opening the Canisteo mines and experimenting with a washery to treat the sandy ores of the west Mesabi range. The announcement was made that the experiment is a success, and that the company was just beginning the construction of a permanent washing plant, on the shore of Trout lake. This plant will consist, at first, of five units, each capable of treating not less than 1000 tons per 10 hours. By the use of a machine called a turbo, the loss has been reduced to 13 per cent. This machine is similar to a screw conveyer, segmented, and running in an open curved trough; through the bottom water is forced, agitating the material as it is carried along the trough. The loss will be further reduced about one-half by the addition of settling tanks, through which the tailings water will pass. Experiments in the small mill erected here show that 40 tons can be treated in about 15 minutes. The ore going into the works is as low as 35 per cent. iron, the washed ore being about 59 to 60 per cent., with better structure; with the present loss this makes a concentration of about two into one, for the lower grade. No details as to cost were given, and perhaps cannot be, on account of the experimental nature of the work so far. The successful outcome of this experiment, however, has added many hundred million tons of ore to the resources of the Mesabi range and the tonnage of the Steel Corporation, and too much credit cannot be given the tenacity of purpose and the bravery of execution that has countenanced an expenditure exceeding $4,000,000 on an experiment, however justifiable. Four million yards have been stripped at Canisteo and Holman and only 30,000 tons of ore have been shipped. Big shipments cannot begin for two years.

The production of asbestos in the United States in 1907, was 950 short tons, valued at $11,900.

St. John del Rey Gold Mining Company

SPECIAL CORRESPONDENCE

The St. John Del Rey Mining Company owns a gold mine in Brazil and in respect to age, it is one of the oldest established mining companies in existence. The annual meeting held this month is the seventy-seventh, so that the formation of the company must have been in the year 1830. During its long career it has twice been reconstructed, and has now an issued capital of £646,265, divided into 546,265 ordinary £1 shares and £100,000 in 10-per cent. preference shares. There are also debenture bonds outstanding amounting to £82,220.

The net profit for the year ended Feb. 29, 1908, was £70,840, which compares favorably with the average profit of the six preceding years, £58,747. According to the sectional plan of the mine attached to the report the lowest workings are at a depth of 4000 ft. below the adit at which depth the lode is reported to compare favorably, both as regards area and quality, with the workings above. Attention is called in the report to labor difficulties. It appears that the company imported a large number of miners from Spain, but failed to get more than a small proportion at the mines. Most of the men found that there was a demand for their services at Rio de Janeiro, and were able somehow or other to evade their agreements.

The 120-stamp mill of the Morro Velho mine was in operation during the year, crushing 151,454 tons (2240 lb.) from which gold to the value of £324,882 was produced. Excluding gold won from low-grade stone, rusty sand, etc., the average recovery was $10.15 per long ton crushed or calculated on the ton of 2000 lb. a return of $9.05 or, say, 9 dwt. fine gold. The working costs at the Morro Velho mine are classified as follows, per long ton crushed:

Mine department	$3.19
Reduction	2.34
Mechanics and general	1.37
Total	$6.90

To this must be added for duties, transport charges, development and London expenses, $1.11, making a total of $8.01 per ton.

On the short ton the costs are in round figures $7.20 per ton. A statement is given showing the details of the capital expenditure for the period March 1, 1901 to Feb. 29, 1908, amounting to £229,839. The bulk of the expenditure has been in connection with the installation of new power plant. The funds have been raised partly by an issue of shares and to the amount of £132,065 by transfers from profits.

Attached to the report of the directors, is a lengthy report by George Chalmers, superintendent at the mines. Full particulars are given of the work done and estimates are made of what may be expected in the future. The ore reserves are estimated to be sufficient to continue the present output on a safe basis for six years, and it is confidently expected that this reserve can be maintained by development below the present bottom of the mine. The average width of the lode at bottom is 10 ft. In discussing the sanitary condition of the mine the superintendent says that dust protectors have been provided but that the men will not use them. In all mines it is difficult to get men to use safety appliances to reduce the dangers of miners' phthisis and Morro Velho is no exception. As regards labor the manager refers to its poor average quality, and expresses the opinion that it would be more economical to employ, if it were possible, first-class miners at the highest rate of wages, rather than poor labor at a lower price. The average gold recovery is given as 91.06 per cent., as against 97.93 in 1907; and considering the refractory character of the ore, which contains sulphides to the extent of 30 to 40 per cent. this extraction is praiseworthy. The manager describes the numerous experiments that have been made from time to time and explains how the success of the present process is largely due to the introduction of the cyanide process and of tube mills for finer grinding. It is of interest to note that tube mills at this mine are of local manufacture. The secondary process used for extracting gold from the slimes is called the oxygen process, and was answerable during the year for 21.68 per cent. of the recovery. Attention is called to the fact that the mine is situated in an isolated part of the country, far from factories or coalfields and that consequently it has to be made as independent as possible. The company enters into a number of trades to supply its wants and has heavy establishment charges. A large output is therefore required, so that these charges may be of moderate amount compared with the total expenditure.

As explained above, a considerable capital expenditure has already been made to equip the mine so as to enable it to maintain a large output. The benefit of this expenditure is now being felt and the good results may lead the directors to still further expand the production by carrying out some railway work, which would connect some of the outlying mines with the central mill at Morro Velho.

The report is drawn up in somewhat an old-fashioned manner, but it is none the worse for that. It strikes one as being thoroughly straightforward, and one in which no attempt is made to conceal from the shareholders any weak spot in the finance or in the condition of the mine. Facts and figures are intelligently put forward, and it is not necessary to be an accountant or a professional mining man to understand the past results and the future prospects of this admirably managed company. Perhaps it is because the directors are aware that their report, as a report, is above the average that they mark it "price one shilling." It is worth it anyhow.

An English Gold Mine

SPECIAL CORRESPONDENCE

About a year ago a mysterious syndicate, called the Chastan Syndicate, was formed which claimed to have discovered a new goldfield in England. The formation, it was said, was similar to that of the Rand, and the property had, therefore, immense possibilities. No information could be obtained for a long time as to its situation. This had to be kept dark until all the available ground had been legally secured. This story seems to have satisfied some people. At all events shares were bought and sold at high prices, to the advantage of the vendors and at the expense of the credulous public. A case in the courts last week throws some light on this business. The syndicate brought an action against a gentleman whose name had been put on the share register without any authority by his cousin, one H. A. Trower, described as a financier, who had been connected with the Whitaker Wright companies of evil reputation. The claim was for calls unpaid and the syndicate took its case. The property is situated in the Forest of Dean, Gloucestershire, and the mine appears to consist of some beds of old red sandstone, which are said to be auriferous, but not in paying quantities. It came out on the trial that one of the promoters, a Mr. Kennedy, who was vendor, managing director and solicitor to the company, has netted £6000, while a statement that H. A. Trower, who did not appear, had made £26,000 out of the business, was left unchallenged. In cross-examination Mr. Kennedy announced that some of the shareholders were bringing an action against him for the return of £11,000 paid for shares, and it is to be hoped that this gentleman and the other promoters will be made to disgorge. It is only fair to say that the defendant in the action just tried withdrew the allegations of fraud and misrepresentation that had been made against the plaintiffs in the pleadings. There appears to be a conglomerate formation and there appears to be gold in it. But it does not appear to be payable, and the promoters do not appear to have done their duty in calling in competent professional men to report on the merits of the undertaking before offering shares for sale.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Forbes Julian, of London, is on his way to Mexico on professional business.

Bernard MacDonald, who has been in New York for the last three weeks, has returned to Guanajuato, Mexico.

C. F. Moore, of Salt Lake City, is back in Mexico City after an extended trip into the southern part of Mexico.

Wong Kokshan has been appointed manager of the Ping-han-yeh Coal and Iron Company, of Hankow, China.

E. N. Atkins, of the firm of DeGolia & Atkins, San Francisco, is examining mining property in Tuolumne county, California.

A. H. Bromly has been appointed manager of the Pacific Copper Company, with headquarters at Sihuatanejo, Guerrero, Mexico.

John D. Ryan, managing director of the Amalgamated Copper Company, is in the Lake Superior copper country for a short visit.

Clive B. Newcomb arrived in the City of Mexico, July 8. He will be associated with George M. White as metallurgist and mill builder.

Donald B. Gillies, of Tonopah, Nevada, is in Mexico with a number of the stockholders of the San Toy Mining Company, of Chihuahua, Mexico.

W. Murdock Wiley on July 1 resigned his position as president and director of the San Gregorio Mining and Railway Company, of Guanajuato, Mexico.

George E. Ross, recently with the Acadia Coal Company, has been appointed manager of the Lake Copper Company, at Copper Lake, Antigonish, Nova Scotia.

R. B. McGinnis has returned to San Francisco from an examination of the Promontorio mine, in Cusihuiriachic, Chihuahua, Mexico, for California people.

Prof. C. E. Rowe, head of the School of Mines, University of Texas, is spending the summer in Colorado and will make Denver his headquarters during that time.

Bainbridge, Seymour & Co., mining engineers, formerly of 1 St. Helen's Place, London, England, have moved into their new offices at 352-5 Salisbury House, London Wall.

Austin H. Brown, for some years past general manager of the Trinity Copper Company, has severed his connection with that company. His address is at Redding, California.

H. F. Lefevre, of New York, has been in Nevada and Mexico on professional business, and is now on his way to Central America, where he expects to remain about a month.

T. H. Oxnam has returned to Los Angeles from an examination of the Santa Barbara mine of the Rio de Plata Mining Company, near Guazapares, Chihuahua, Mexico.

J. P. Hutchins, consulting mining engineer, of New York, has gone to British Columbia on professional business, which is likely to occupy him for a considerable portion of the summer.

Roy N. Bishop, manager of the Balaklala Consolidated and the First National Copper companies, is now also manager of the Trinity Copper Company, with office at Coram, Shasta county, California.

Wm, Howard has resigned his position as superintendent of the cyanide mill of the Esperanzas Mining Company, El Oro, Mexico, to take a similar position with the Amparo Mining Company, near Etzatlan, Jalisco, Mexico.

Captain Charles Trezona has been appointed general manager of all the Oliver Iron Mining Company's mines on the Vermilion range in Minnesota. He has been in active charge of the mines for some time.

Randolph Bolling, recently consulting metallurgist of the Nova Scotia Steel and Coal Company, Ltd., at Sydney Mines, N. S., severed his connection with that company last March. He is now engaged in professional work in Virginia.

Dr. W. C. Heraeus has been awarded the John Scott legacy premium and medal of the Franklin Institute of Philadelphia, for his improvements on the Heraeus-Le Chatelier pyrometer, and for the accuracy and interchangeability of the thermocouple which he has devised, known as the Heraeus element.

Obituary

Charles Vincent Potter died June 1, at Balwyn, near Melbourne, Victoria, Australia. He was the inventor of a number of mechanical and metallurgical devices, the best known being the Potter flotation process for the treatment of sulphide ores, which is now in use at Broken Hill, New South Wales.

Joshua Walter Rhodes, who died at Detroit, Mich., June 30, was born in Pittsburg in 1872, and was brought up in the iron trade, in which his father is still prominent. He was interested in several iron companies, and organized the Cherry Valley Iron Company at Leetonia, Ohio. This was merged in the United Iron and Steel Company in 1905, Mr. Rhodes being active in the management of the new company.

Societies and Technical Schools

University of Nevada—The new catalog of this institution at Carson City, Nev., shows full courses in mining and metallurgy. The mining department is housed in the new Mackay building, recently described, and has 61 students.

University of Utah—In its new catalog this institution at Salt Lake City reports 190 students in the School of Mines. A new building 104x62 ft. has recently been added, and is well supplied with milling and smelting machinery, and an assay room with all necessary appliances.

Bituminous Mine Foremen's and Firebosses' Association—This association has been formed with headquarters at Barnesboro, Penn. John Hayes, Carroltown, Penn., is secretary. At the request of the Chief of the Bureau of Mines of Pennsylvania, the association sent a delegate to the conference held at Pittsburg, July 7-9, on the proposed new mine law for the State.

Colorado School of Mines—On the basis of gifts from Thomas F. Walsh and others, the trustees have established a separate fund, to be called the Vinson-Walsh fund, to be used to maintain a bureau of original research. The first work of this bureau will be to investigate the occurrence of rare minerals and metals in Colorado, their uses and possibilities. This bureau will be under charge of Dr. Herman Fleck, professor of chemistry, with Sidney W. French as special assistant.

Western University of Pennsylvania—The 1908 catalog of the School of Mines of this university at Pittsburg shows a number of courses, permitting a wide range of subjects to be chosen by candidates for the degree of mining engineer and metallurgical engineer. In addition to the regular courses, special or partial courses are provided, especially intended for men who have had practical experience in mining, and desire to fit themselves for positions as foremen, superintendents, etc. The school has been thoroughly reorganized and its teaching facilities much enlarged.

University of Arkansas—The Department of Geology and Mining of this university, at Fayetteville, Ark., will offer next fall a four-years' course for the degree of "bachelor of science in cement engineering." Besides the general engineering, geology, etc., special work extending over two years will be given in the geology, occurrence, examination and testing of cement materials and in designing and operation of cement plants. Besides the nearness of the well equipped plants in the Kansas gas district the university is especially well situated for this work, since in the immediate vicinity of Fayetteville are several well exposed outcrops of limestone and shale, suitable for making portland cement. At least two months' actual work at a cement plant will also be required before the degree is granted.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Goldfield, Butte, Salt Lake City, Denver, Toronto and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

July 2—The Standard mine, near Cima, San Bernardino county, idle for the past year owing to litigation, is being reopened. The ore carries both gold and copper. The deepest shaft on the property is 256 ft., and some 4000 ft. of crosscuts and drifts have been cut.

The Tecopa silver-lead mines at Tecopa in Inyo county, on the border of San Bernardino county, will be shortly started up again under superintendence of J. H. Lester, the former manager. The mine last year shipped all its ore to Salt Lake smelters, this ore carrying both lead and silver. The mines ceased shipping a few months ago while a concentrator is being erected. The two mines operated are the Gunsight and Noonday, which are about a mile apart. Extensive development work is about to be undertaken and some 50 men will be set at work. Mines were worked in this section in the early seventies and some high-grade ore hauled out by team. When the Tonopah & Tidewater railroad was built within a few miles of the properties much lower-grade ore could be shipped at good profit. The ore is of a desirable fluxing character and in demand at the smelters. Leasers on the Alexandria claim of the company have recently shipped considerable high-grade ore. The properties are 35 miles south of Greenwater. W. A. Starr is president of the company.

There have been several oil excitements in the desert region of San Bernardino county, but nothing has come of them thus far. Now, however, some hundreds of prospectors are rushing to a tract five miles south of Daggett, where traces of oil have been found. Some thousands of acres of land have already been located, and boring will begin at once. The discovery of oil was made in a well sunk for water.

The mining engineers who have been experting the numerous properties of the Champion Mining Company at Nevada City, have completed their examinations and will forward their report to H. G. Torrence in London. These are the most important quartz mines in Nevada City and comprise some 30 or more claims at that place and others in other parts of the county. After long litigation, and resultant idleness, the Champion won its suit and last year again became productive. The owners, however, have not sufficient funds to carry on necessary explorations on so extensive a property and have accordingly bonded it. The recent examinations were made in the interest of English capitalists holding the bond.

Nevada county is about to advertise its mineral resources in San Francisco, by installing a permanent display of gold quartz, nuggets, etc., in the Mining Bureau quarters in the Ferry building. Cabinet specimens are now being collected for this purpose and it is expected that some $20,000 worth will shortly be on display. As many mines as possible will be represented. Nevada was the banner gold county of California for many years continuously although now the dredges in Butte county show the largest output of gold.

The Pennsylvania Dredging Company, at Oroville, which has been enjoined from working by the efforts of Sutter county, did not have its dredge working in the Feather river at all. The pit in which the dredge floats is separated from the river by a rim of some 20 or 25 ft. in width, and 3 ft. above the level of the river. Nevertheless the Anti-Débris people assert that a large quantity of the tailings escape daily into the Feather river. The matter will be brought out clearly in the coming trial. It is noteworthy, however, that the dredge is not working, nor has it been, in the river bed proper.

"Paddy" Campbell's once famous Blue Point hydraulic mine, near Smartsville, Yuba county, is being put in shape to be again productive, but this time, the gravel will be worked in water-power arrastras and not by hydraulic process. The new company has paid all delinquent taxes, cleared off a $45,000 mortgage, and is now making headway in clearing away brush and trees along the old water ditch, which has been idle for years. The ditch in former years supplied a great many farms with water, winding about in a devious course, until it reached the gravel diggings. It was a big revenue getter, but since Campbell ceased mining operations it has been altogether neglected. Its entire length of 38 miles has been overgrown, but the men clearing it out have only about 10 miles yet to go before their part of the work will be finished. The company intends to enlarge the ditch to 6 ft. at the bottom, 12 at the top and 4 ft. deep, carrying a larger volume of water than ever. The work of completing this task will be slow and costly; and in places attended with much difficulty.

The Tightner mine at Alleghany, Sierra county, continues to yield very largely. The last clean-up was $102,000, taken out in one week by four men. A sale of this mine recently fell through because the expert reported it to be "pockety." H. L. Johnson has since taken out as much as he offered to sell for and the phenomenally rich ore still continues. Numbers of miners have started prospecting and reopening old claims in the Alleghany section, attracted by this rich find in the Tightner.

The Hidden Treasure drift mine on the Forest Hill divide in Placer county, is the most extensive mine of its character in California, and the most completely developed and equipped. It has been worked for many years and is now in charge of Harold M. Power, son of Harold T. Power. This same channel has been in charge of the grandfather, son and grandson successively, three generations of the same family having taken their turn at managing the working of the property.

The trouble between the Lawley heirs over the ownership of certain properties resulted last week in the sale at public auction of the Cloverdale quicksilver mine, in Sonoma county, by the referee of the court. It was bought by Mrs. Mary Patten, one of the heirs, for $15,000. The mine has been worked by Lawley Brothers for a number of years in a small way, the production being a few hundred flasks of quicksilver yearly.

At the annual meeting of the Steifer Mining Company, which is working a gravel channel on the Magalia ridge in Butte county, some dissatisfied stockholders criticized the management for failure to bring forward promised returns on the investment. Nevertheless Steifer Brothers, who own the controlling interest in the property, were again elected officers and directors, the majority of the stockholders being satisfied with the reports of progress. P. B. Steifer is president and M. Y. Steifer secretary of the company. A great deal of development work has been done on the property within the past years, but there have been no profits as yet.

As soon as the testimony taken at Quincy, Plumas county, can be transcribed, the mineral land case of the Government against E. V. Darby, N. F. Golden and others will be placed in the hands of the Susanville officials for decision, after which it will be taken to Washington to be passed upon by the Commissioner of the General Land Office and perhaps the Secretary of the Interior. About 960 acres are involved, the Govern-

ment's witnesses contending that the land is more valuable for its timber than mineral, and the defense arguing to the contrary. The Government, probably because of the taking up of land by corporations, is becoming more strict in its inquiries, and, as this case shows, demands definite information, development work on mining claims and a definite estimate as to mineral values.

Greenwater, the copper camp of Inyo county, which two years ago attracted so much attention, is again to the front, after being dead for many months. It is now reported that the shaft sunk by the Charles M. Schwab interests on the Copper Queen No. 2, about half a mile southwest of the town of Greenwater, struck an orebody between the 960- and 1000-ft. levels, and that assays of this ore show it to average high in copper, with a fair showing of gold. The strike, it is said, was made about June 1, but was kept as quiet as possible until the Schwab interests could secure control of contiguous territory. Meantime there is again a rush of prospectors and others into the camp, incited by this reported discovery.

An important sale for the gold camp of Randsburg, Kern county, is that of A. C. White's Sydney mine to Eastern men, represented by E. V. Williams of Los Angeles. The price is reported at $75,000. The mine has been more or less productive for the past 10 years. The new owners of the property will arrange for extensive development, and one of the methods the syndicate is said to be considering is the tunneling of the mountain from the Garlock side, which will greatly facilitate the removal of ore.

Goldfield, Nevada

July 1—A. D. Parker, vice-president of the Florence-Goldfield Mining Company, arrived this week and thoroughly inspected the properties. He absolutely denies any sale or intended sale of the Florence to the Consolidated, although it is tacitly admitted that the apex trouble between the Jumbo Extension and the Consolidated, the former a Parker-Lockhart property, will be amicably adjusted. The third quarterly dividend of 10c., amounting to $105,000, was posted, payable July 15. President Lockhart has been adjudged in contempt of court for refusing to pay into the custody of the court the $117,935, which is ordered impounded upon the prayer of the Little Florence lease.

The controversy between the Consolidated and D. Mackenzie, who controlled the Frances-Mohawk Leasing Company, passed through another stage this week, but is still in the hands of the court. After the lease had expired a big cave-in occurred. The Consolidated accused the leasers of bad mining, and brought suit, placing an attachment on $125,000, which was to the company's credit in the bank. The end is not yet.

J. R. Egan has brought suit against the Frances-Mohawk company and the Keane Wonder Mining Company for the recovery of 160,000 shares of stock of the latter company. He alleges in his complaint that the Frances-Mohawk company took up, without his knowledge or consent, the last four notes issued by the Keane Wonder company and held by the State bank, and also the block of stock mentioned which he allowed to be used as security, together with over 800,000 shares advanced by Homer Wilson merely as an accommodation. This is another interesting echo of the looting of the State bank of its valuable assets by favored customers after the officials had taken the cream.

Henry Weber has been found guilty of embezzlement by the jury and sentenced to seven years in the penitentiary. Weber was one of the many young men who in the boom days here made money so fast that they overlooked the fundamentals. The community at large sympathizes with Weber, but deprecates the immense harm done to Goldfield and Nevada by these wild-catting affairs. Weber was allowed bail pending his appeal, on account of his poor health.

Three companies paid five dividends here in June, amounting to $235,000. This does not include $32,000 from the Round Mountain Mining Company, which is owned here whence the dividend was paid.

The Loftus-Davis Leasing Company has been reorganized under the name of the Loftus-Davis Federated Mines Company, and the capitalization increased from 50,000 to 250,000 shares. No stock was offered to the public and all subscriptions were at par.

Combination Fraction has about the only live stock on the local market this week, and that, due to the activity of this stock in San Francisco, where George Wingfield is said to have been buying all the shares offered. Rumor has it that A. D. Myer, who with Tom Murphy, owns the control, has sold out his entire interest to the Consolidated, and that Wingfield's buying is for the same account. The facts are not yet obtainable.

Salt Lake City

July 2—The property of the St. Joe Mining Company in Bingham has been sold under an execution for $25,000. It was bid in by some of the leading stockholders.

The United States lead smelter at Bingham Junction will resume operation not later than Aug. 1. The company has begun receiving custom ore and has ordered production started again from the Richmond-Eureka mine at Eureka, Nevada, which has been idle for about six months. One converter at the smelter is now in commission, cleaning up a lot of matte and silicious ores which were not used up when the plant was shut down last February.

The quarterly report of Coal Mine Inspector J. E. Petit has been submitted to Governor John C. Cutler and covers the second quarter of the year. General conditions of the mines are reported good and with a single exception found them to be free from firedamp. Some carelessness with explosives at the Pleasant Valley mine of the Union Pacific Coal Company, and in the property of the Independent Coal Company, at Kenilworth were reported, but mine officials promptly corrected the fault on being notified.

A deed has been filed conveying all the property of the South Columbus Mining Company, to the South Columbus Consolidated Mining Company, the successor of the former.

Judge Marshall, of the Federal court, has granted the application of the Silver King Consolidated Mining Company, for an order of court permitting its surveyors to enter the Silver King Coalition mine at Park City for the purpose of surveying certain workings alleged to have been extended into the property of the former. The court also granted the Silver King Consolidated officials the right to tear out any bulkheads or other obstructions should any be found to interfere with the work of the surveyors. In event of any caves being found, the court instructs that prompt notice thereof be made known, when such relief as necessary will be forthcoming. The Silver King Coalition Company is defendant in suits involving the unlawful extraction of ore. A similar order was made on the same date permitting engineers in the employ of N. Treweek and others, owners of adjoining property, to enter certain levels of the Coalition mine for a like purpose. The suit pending involves between $3,000,000 and $5,000,000, the value of ore alleged to have been unlawfully taken.

The Taylor & Brunton Sampling Company, has concluded to erect a sampling mill in the Tintic mining district not far from the new Tintic smelter. It will have capacity for 600 tons of ore per day. Work on the plant is to begin right away.

The Ohio-Kentucky Mining Company, with headquarters in Salt Lake, but operating at Pioche, Nev., has purchased the property of the Nevada-Pioche Mining Company, where the main works will be placed.

A special meeting of shareholders of the American Flag Mining Company, has been called for July 11, when the matter of issuing $150,000 in bonds will receive consideration. It is proposed to raise funds in this manner sufficient to provide milling facilities. This company operates at Park City.

Butte

July 2—The Anaconda mine resumed operations yesterday after a shut-down of several weeks. The line of the Great Northern Railway, connecting Butte and

Great Falls will be ready for traffic in a few days. The annual meeting of the stockholders of the East Butte company has been again postponed on account of the absence of some of the directors, and July 8 fixed as the date for the meeting. Work on the new 300-ton concentrator of the Pittsburg & Montana company is being pushed rapidly. The Mountain View mine of the Boston & Montana company is closed, awaiting the repairing of the smelter at Great Falls; the Pennsylvania mine of the same company is also shut down while the shaft is being re-timbered. At the annual meeting of stockholders of the Tuolumne Mining Company, recently held in Butte, directors were elected in place of F. A. Heinze, resigned, and D. J. Hennessey, deceased.

Denver

July 3—In the Cripple Creek district, the output for June is given at 64,150 tons, with a gross value of $1,302,530. The deep drainage tunnel has now been driven 2700 ft., the intermediate shaft being down 460 ft., and is expected to reach the level of the tunnel by September.

In the suits of the Portland Gold Mining Company, against Stratton's Independence, Ltd., to recover $400,000 and damages for value of ore alleged to have been extracted by the latter's lessees from the ground of the former, a decision has been rendered in the Court of Appeals, denying a motion for a re-hearing of the case, which was decided in favor of Stratton's Independence by the United States Court, and afterward sustained on appeal to the higher court. It is said that the case will be taken to the Supreme Court of the United States.

The annual stockholders' meeting of the Elkton Consolidated Mining and Milling Company, will be held at Colorado Springs July 13.

In the Silverton district, the old North Star, on Sultan mountain, is credited with an important strike of 4 ft. of $80 ore, of which $60 is gold. At the close of 1882, this mine had produced, according to the director of the mint, 100,000 oz. silver, and 1,500,000 lb. lead, the average of the ore being about 0.5 oz. gold, 40 oz. silver to the ton and 50 per cent. lead. It is a fissure vein in monzonite, the character of the ore being galena and gray copper. The new shoot is said to have a length of 145 ft. and a known depth of 800 feet.

In the Yampa coalfield, Routt county, the Perry mine, on Oak creek, has now a slope on the seam 600 ft. in length, and the mine is being opened up and equipped with up-to-date machinery for the purpose of supplying the locomotives of the Denver, Northwestern & Pacific railway with coal. The grade of this railroad is completed to the foot of the dump, and rails will be laid and trains operated probably in November. The seam shows 10 ft. of bright, dense coal in all the openings, and 65 tons per day are being taken out in doing deadwork alone. This is the first mine being systematically opened in this new coalfield.

Peoria, Illinois

The recent act requiring coal miners in Illinois to obtain certificates of competency having been referred to the legal department of the State for an opinion on certain of its provisions, Attorney-General Stead holds that the miners' qualification act applies only to men actually engaged in cutting and digging coal, and has no reference to others employed at the mines. He also holds that managers and examiners who hold certificates from the respective boards must, if they dig or cut coal in addition to their duties, obtain certificates of competency. Miners engaged in their work July 1, and for two years prior to that date, are entitled to certificates upon proof of such service without answering the 12 questions required by the law. Everyone to whom a certificate is granted must pay a fee of $1 to the examining board.

In view of the impossibility of examining all miners and issuing certificates before the law took effect on July 1, it is understood that no prosecutions for violation of the law by working without a certificate, or by employing unlicensed miners, will be begun until a reasonable time has elapsed.

Toronto

July 6—Extensive bush fires near Cobalt have done considerable damage to some of the outlying mining properties. The district affected was the southeastern portion of Coleman township. On June 28 the fire destroyed the buildings and machinery of the Columbus, Coleman Development, Cochrane, Lumsden, Shamrock and Fisher-Eplett companies and many other properties narrowly escaped. The smoke was dense rendering it difficult to fight the flames, but the miners worked heroically and saved many buildings. The Temiskaming lost its powder house. The fires did not reach Cobalt and none of the large shipping mines were touched. The fire finally burned itself out and heavy rains, which fell on July 1 helped to subdue it.

London

June 27—An attempt is being made to raise capital in order to restart one of the old tin mines of the St. Just district, Cornwall. The new company that it is proposed to form is to be called the Boscaswell United Tin and Copper Mines, Ltd., with a capital of £200,000, half of which is in ordinary shares and half in deferred shares. A lengthy prospectus, describing the past history of the mines and the future possibilities according to J. H. Collins and others, has been somewhat lavishly advertised. And to make the venture the more attractive, a plan of the locality, fairly bristling with lodes, has been issued, as well as a section containing the most precise information as to the ore reserves. Stopes worked out, stopes containing pillars of ore and payable deads, ore developed on one side and on three sides and ore not developed at all are shown to the future shareholder. Considering that the greater part of the old workings must be inaccessible, the valuation of a mine or these lines is ridiculous, and is not creditable to the professional men concerned. The mines may be worth reopening, granted that sufficient capital is provided, but there must necessarily be much uncertainty as to the value of the ore and as to the capital required in a mine of this class. The condition of the old levels and shafts must be more or less a doubtful quantity, and past records as regards tonnages and values of old Cornish mines are notoriously of a vague character. Valuations and estimates such as occur in this prospectus are to be deprecated. They certainly must fail to inspire business men with confidence, especially if they take professional advice before making an investment in mining property.

There are other features in this prospectus which call for unfavorable comment. It is stated that the vendors are taking the whole of their purchase consideration in deferred ordinary shares, which do not rank for dividends until 7 per cent. has been paid on the ordinary shares. Yet among the contracts it appears that the Cornish Finance Syndicate, Ltd., which is the immediate vendor and promoter of this company, is to receive £10,000 in preferred ordinary shares or cash from the new company as consideration for paying all preliminary expenses. As noted above, the amount spent on advertising has been heavy, but if the expenses come to less than £10,000, the promoters will not be paid entirely in deferred shares, and that statement does not appear to be quite straightforward.

Another point to be noticed is that the articles of association allow the directors to proceed to allotment, if 10 per cent. of the shares offered are subscribed for. The directors, however, say that they will not proceed to allotment unless at least 15,000 of the shares are applied for. Mr. Collins has estimated that £75,000 will be sufficient to equip the combined properties on a large scale, so that to go ahead with only £15,000 seems to be courting disaster. It is, however, stated that Mr. James, the company's general superintendent, considers that £12,500 will make a portion of the property payable; and it looks as if the directors intend to go ahead if only £15,000 is subscribed. The vendors in that event will, it is to be hoped, take their consideration of £10,000 for preliminary expenses in the form of shares; otherwise the working capital will be trivial.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

BIBB COUNTY

Woodward Iron Company—This company has begun work on a new brown iron-ore mine at Woodstock, where the company's ore fields are. Two miles of new track are being constructed from the Alabama Great Southern railroad to the proposed slope and the necessary machinery, which has been purchased, will be installed in due course.

Alaska

KETCHIKAN DISTRICT

It Copper Mine—Work has been begun on a tramway 5200 ft. long from this mine to Kasaan bay. For 1200 ft. from the mine the tramway will be worked by gravity; the remaining 4000 ft. being nearly level. At the bay a wharf 1200 ft. long is being built out to deep water, permitting the direct transfer of ore from cars to vessels.

Jessie—Work on this gold mine at Dolomi is advancing well. The shaft is now down 80 ft. and is in ore. Drifting will be started at the 100-ft. level.

Arizona

YUMA COUNTY

Cobralla—One of the richest mineral sections of Arizona has been opened up by the building of the Arizona & California railroad. At present the road extends to Parker at which point a steel bridge is being constructed. Among the most productive properties of that section of the territory is the Cobralla property which was discovered about 18 months ago and has rapidly gained prominence. Development during the past year has exposed bodies of sulphide ores in a lime and porphyry formation similar to that at Bisbee, Clifton, Morenci and Globe with the exception that the Cobralla ores run high in gold and silver as well as copper.

California

AMADOR COUNTY

Bay State—Men are repairing the recently burned hoist at this mine near Plymouth, preparatory to reopening the property.

Little Illinois—The company holding under bond the Little Illinois mine at Drytown is preparing to reopen it.

BUTTE COUNTY

Blue Lead—In this property at Bangor the 1000-ft. tunnel has been completed, and paying gravel reached.

Butte Creek Consolidated Dredging Company—The timbers for the new dredge of this company have arrived on the ground and construction will now begin.

Cape Horn—All the machinery is now in place at this mine, including the gravel mill, and work on the mine is to be done on a large scale.

CALAVERAS COUNTY

Dredge—T. C. Huxley, of Oakland, has bought the Green Mountain placer mine, the Eastern Extension, the Green Mountain Extension, and the Chile Gulch Fluming Company's mine, near Chile Gulch, and will organize a company to dredge the ground.

Stockton Ridge Consolidated—This company, operating the Hexter tunnel gravel mine near Mokelumne Hill, Stephen Hughes, superintendent, now has its tunnel in 1725 ft. and small seams of cemented gravel are being found.

Utica Mining Company—In this mine at Angels a rich pocket containing a few thousand dollars was found recently, which was exaggerated in the newspapers up to several hundred thousands.

EL DORADO COUNTY

Prevolcanic Channel Gold Mining Company—This company, near Pacific House, is running drifts to ascertain the extent of the cemented gravel, and will put up a mill to crush it.

INYO COUNTY

Empire—At these silver claims, J. B. Ellis, superintendent, near the junction of Black and Marble cañons, some shipping ore is being taken out, and development is being advanced.

KERN COUNTY

Cottonwood—Miners working on an abandoned and filled-in prospect hole in Cottonwood creek, on the south side of the Piute, have struck rich ribbon rock. Along the same creek W. E. Congdon is having a number of holes sunk with a well-drilling apparatus to determine the value of the sands.

MARIPOSA COUNTY

No. 5—Doctor O'Brien and associates recently purchased this mine near Hornitos, and development having proven its richness, they are now about to erect a mill. The mine has been idle many years.

NEVADA COUNTY

Celina—At this property, Washington district, three shifts of miners are at work in the new tunnel, and as soon as the vein is intersected a mill and other surface improvements will be built. C. L. Stokes is manager.

Erie—At this mine, near Graniteville, Geo. Mainhart and associates are doing preparatory work in the reopening operations.

Inkmarque—The four miners who have leased this Grass Valley mine for two years from Louis Rosenthal have unwatered it and commenced active mining.

PLUMAS COUNTY

Del Monte—J. D. Murray, who has a bond on this group of mines on the North fork, has uncovered a good ledge, which is being developed.

Gruss—L. R. Gruss has purchased a new hoist for this mine, the Genesee. The 15-stamp mill will shortly be running.

Seneca—The production of gold from this mine (formerly the White Lily) at Seneca, is attracting many miners to that locality.

SAN BERNARDINO COUNTY

Orange Blossom—At the property of this company, near Bagdad, a rich strike has been made. The corporation is a close one with John Denair, of Los Angeles, superintendent.

Oro Belle Mines Company—This company, formed of Duluth, Minn., capitalists, has made final payment to Hart & Hilt for the Oro Belle and Oro Belle Fraction mines at Hart, and active operations have been inaugurated.

SAN DIEGO COUNTY

Buckhorn—R. P. Macpherson has been appointed superintendent of this property at Dulzura, and extensive preparatory operations have commenced.

Encinitas—This old camp is taking on new life and more extensive developments are being made than formerly.

SHASTA COUNTY

E. P. Connor Group—Connor & Corbiere have formed a company to develop this group of eight claims at Harrison gulch (Knob P. O.).

Victor Gold—At this property, Harrison gulch, they are building a gallows frame for the new hoisting plant.

SIERRA COUNTY

Forest City—This company, operating the Mabel Mertz mine, near Forest City, expects to reach gravel in the main tunnel this month.

Grizzly Consolidated—P. F. Roddy and associates have leased this mine near Poker Flat.

Poker Flat—A shaft is being sunk through the lava to strike the gravel in this mine at Poker Flat. M. Duval is superintendent.

SISKIYOU COUNTY

Blue Ledge—This copper property, near the Oregon boundary line, has been closed down until financial affairs are in better condition. Large sums have been spent on the property, but both a smelter and railroad are needed to put it on a paying basis.

TUOLUMNE COUNTY

Dreisam—The recent strike in this old mine continues to yield well. W. W. Parlin has become a part owner in the property.

Fair Oaks—A new hoist is being installed at this mine near Columbia. C. F. Layman is superintendent.

Colorado

BOULDER COUNTY

Ida Mining and Milling Company—This company has been organized with $25,000 capital and Denver people are interested. One of the directors has invented a new machine which is being used for working the dump of the famous Caribou mine near Cardinal.

Monarch—Messrs. Waltemeyer and Wolcott, of this company, operating the Wano mill at Jamestown, Colo., have gone to Omaha, Neb., to consult with their associates as to increasing the capacity of the mill and additional facilities for larger operations at the mine. The monthly returns from their mill are about $10,000, the ores averaging about $10 per ton.

CLEAR CREEK COUNTY

Colorado Central—Ruby silver has been opened up in the Ocean Wave level, which is being worked under lease by F. A. Maxwell, of Georgetown.

Mint—This mine, on McClelland mountain, is to have a plant of machinery operated by electric power, for the purpose of driving the big crosscut. J. U. Harris, Georgetown, Colo., is manager.

Princess of India—A lease and bond for one year in the sum of $30,000 has been given to New York people, and a heavy compressor plant is to be installed in their tunnel on Columbia mountain. J. J. White, Georgetown, Colo., is manager.

LAKE COUNTY—LEADVILLE

Carbonate Hill—The Morning and Evening Stars are working steadily and shipping in the neighborhood of 350 tons daily of an excellent grade of iron. The Little Nell, on the crest of the hill, is shipping steadily a good grade of iron and some sulphides. On the lower part of the hill the Starr people continue to ship from the recent strike and the values hold up to the standard. From the Jolly shaft shipments are steady and the lessees are driving into new territory.

Champion—M. M. Bohen and associates, of Leadville, are working this property, on Battle mountain, and for the last few weeks have been developing a body of sulphide ore. A few days ago a streak, 2 in. wide came in about the middle of the sulphide and this was sacked and 100 lb. of it taken to an assayer at Leadville and it netted in the neighborhood of $30 per pound. The streak is simply a pocket and Mr. Bohen expects to have it worked out in a few days. The sulphide body is of a good grade and shipments are being sent out regularly.

Dinero Tunnel—On this adit, Sugar Loaf district, 240 ft. were driven during the month of June leaving only 360 ft. to be driven before the Dinero veins are cut. At present the tunnel is being driven through black flint.

Down Town Section—The lessees on the Penrose, Midas and Coronado are shipping regularly from the upper levels of the different properties, and at the same time are doing considerable prospecting in new territory. The present month will see the ore tonnage greatly increased as orebodies have been opened. The ore that will be shipped will be principally iron of a good grade. Prospect work is being carried on at the Hibschle shaft, East Seventh street.

Helena—At this mine, Iowa gulch, the ore that was caught at the 500-ft. level shows every sign of being in place and as work proceeds the vein widens; the grade is medium and shipments will be started soon.

Sunday Tunnel—The work of cleaning up and re-timbering is nearly completed, and when the electric plant is installed the work of driving ahead will be started. A station will be cut well in toward the breast and at this point the electric plant will be installed.

MINERAL COUNTY

Rio Grande—This group on Campbell mountain, near Creede, has been leased to a syndicate composed of Creede and Denver people. Work is to begin at once on a large scale.

SAN MIGUEL COUNTY

La Sal—James H. Hill, of New York, has taken a lease and bond on this copper mine at Cashin. The bond is to run one year. It is said that the Denver & Rio Grande railroad will build a branch down the Paradox valley to reach this and other mines in the district.

TELLER COUNTY—CRIPPLE CREEK

During June an advance of 187 ft. was made in the drainage tunnel. The total length on June 30 was 2670 ft. The rock encountered during the month was extremely hard. The intermediate shaft was lowered 98 ft. in June and was 453 ft. deep at the end of the month.

Mary McKinney—The directors have declared a one-cent dividend on the issued capital, making a disbursement of $13,085, payable July 25. This will bring the total dividends paid to $814,150. The directors ceased the payment of dividends in April, 1907, but since then the treasury accumulation warrants the payment of the above amount, besides leaving enough to carry on development work and to pay the company's subscription to the deep drainage tunnel. Another announcement is that the company has leased the main workings of the property down to 700 ft., comprising about 35 acres, to the Western Investment Company. The lease, which runs for two years, provides that the main shaft be sunk to water level.

Ophir—A depth of 200 ft. has been attained in the new vertical shaft on this mine on Raven hill, and a crosscut has been started to the main Ophir vein. At the same time, operations are being carried on from the old incline shaft and a good grade of ore is mined therefrom. The Ophir is owned by the J. J. Cone estate.

Idaho

IDAHO COUNTY

Idaho Mascot—This is a group of three claims near Elk City and adjoining the Del Rio group, which has been recently located by John and Ed. Massam, of Spokane, as quartz-gold mining claims. There is a vein of rich ore 600 ft. from the Del Rio vein which has made a good showing under a small amount of development. The owners have been quietly working to locate the lead for about a year, having found much float near the foot of the hill. An adit is now being run to the lead, but it will take 400 ft. of work to reach it.

Espy—There is now being installed a new five-stamp mill in addition to the three-stamp mill that has been in use for over a year. The mine was bought last fall by eastern capitalists who have put a local man in charge with instructions to open the mine on a large scale. Two adits have shown good results, and now a third is to be run.

Crackerjack—This mine on June 21 came into the possession of M. J. Sweeney, of Spokane, who secured it on a mortgage for $8000. The mine is said

to have owed about $20,000, as a great deal of work had been done toward opening up the large, but low-grade deposits. It has been rumored that Mr. Sweeney is acting for the American Smelting and Refining Company, but confirmation cannot be had. It is not known whether any work will be done this summer or not.

SHOSHONE COUNTY

Copper King—At a special meeting of stockholders, held in Mullan, June 15, it was decided to drive a long crusscut adit on the property to open the ore at depth. Work will be started within 30 days, according to a statement by the management, and will be pushed vigorously. This property has been inactive since the Greenough interests declined to take up an option they held on it last fall.

Charles Dickens—At the annual stockholders' meeting in Spokane last week the following officers were re-elected: President, W. H. Taylor; vice-president, W. N. Nickerson; secretary-treasurer, W. A. Elliott; manager, A. D. Gritman. Manager Gritman states that the mill will be started up shortly.

Indiana

After being under probation for more than a year, 52 miners employed at the Summit mine were expelled from the United Mine Workers of America on June 30, because they refused to submit to fines for participating in a "stampede" strike, as provided in the district agreement between miners and operators. The miners were out eight days on a stampede strike and $8 were deducted from each man's pay. Of the 420 men employed, 52 in all, contrary to the advice of the district officers, brought suit and recovered the amounts deducted from their pay, the court holding the fining clause invalid. The district association made the amounts recovered good to the operators and will reinstate the expelled members as soon as they repay the association the amount of fines; four have already been reinstated and are now employed by the operators.

GREENE COUNTY

Golden Knob—The machinery of this mine, the property of an Ohio company, is being taken out and shipped away. The mine was operated in a small way nearly four years.

P. & I. Coal Mine—This mine, near Jasonville, is again in hard luck, or, rather, the stockholders are, owing to the insolvency of G. G. Hadley & Co., of Chicago, operators. There is a labor indebtedness of $1200 hanging over the mine, besides other bills. Judgments have been taken and executions issued against available property. The mine and equipments have been seized by the sheriff.

PARKE COUNTY

Rush Coal Company—This company, with offices at Cate's Station, has made an assignment. The assets are greater than the liabilities. Homer Hood owns a controlling interest and is general manager. The company has been in operation for five years and was originally established by Toledo men. The property is likely to change hands.

Kansas

ZINC-LEAD DISTRICT

Hartford—This company has just completed a new mill on its lease south of Galena, and is installing a six-drill air compressor.

Michigan

COPPER

Keweenaw—The temporary shaft house at the Medora shaft is nearing completion and will soon be in shape to handle rock. The rock crushers are on the ground and are being assembled; the Phœnix mill is practically ready to begin stamping. The spur connecting the mill to the main line has been widened to standard gage, and barring some unforeseen delays all will be in shape to begin the mill test on this rock the latter part of July. The company's new, or No. 2 shaft has reached the ledge, passing through about 15 ft. of overburden.

Ojibway—Sinking continues at No. 1 shaft, which is down about 230 ft.; the first level will be started at a depth of 500 ft. from surface, when a crosscut will be driven to cut the lode. At No. 2 shaft drifting at the first level, 350 ft. from surface has been suspended in the north end, but continues toward the south; the total length of this drift is about 150 ft. Preparations are being made to resume sinking at No. 2 shaft and the next level will be established at a depth of 500 ft. The formation in the drift is somewhat disturbed, probably due to surface influences and it is believed that, as depth is obtained, conditions will become settled and a more uniform copper-bearing rock will be disclosed. Work has been started on the spur connecting the mine with the Keweenaw Central railroad, and with this connection made the property will be given ample railroad facilities.

Superior—Preparations are being made to install two skips in the shaft. Work on the railroad connecting the mine and the Atlantic mill, will be started soon and will be rushed to completion; when finished a thorough mill test will be made.

Ahmeek—This company will sink two new shafts during the summer; several sand pipes have been driven down to test the overburden and get a contour of the ledge. The proposed shafts will open up the central and northern portions of the tract. The present shaft commands the ground in the southern end and the northern shaft will intercept the lode at depth and will be in close proximity to an extension of No. 5 Mohawk, which is showing up exceedingly well.

IRON

Empire—This mine, on the Cascade range will resume operations in a week or two. The company closed down the mine early in the year, laying off about 50 men.

Brule Mining Company—This company has resumed operations at its Chatham mines at Stambaugh. Only a small force is employed at present.

Missouri

ZINC-LEAD DISTRICT

The Little Princess, Elking and Diamond Jack mills have been shut down. The Fullerton mill has been totally destroyed by fire. The Yellow Dog has laid off 60 men.

Big Chief—This company is putting up a 200-ton mill on its lease, north of the Mission mine at Baxter Springs.

Big Fly—This company made its first turn-in recently, and promises to be a regular produce. Its mill is at Alba.

Continental—This company has started its mill at Johnstown, after a long shutdown. A 10-in. and a 6-in. pump were necessary to drain the mine.

Diamond Jack—The derrick and tramway at this mine have been destroyed by fire.

Eclipse Land—A company—composed of H. H. Black, Charles Humes, E. M. Hunt and J. H. Jackson—has leased 12 lots of this land south of Carterville, and is sinking a shaft to the ore, which was encountered in an abandoned mine at 85 ft. depth.

Granby Mining and Smelting Company—This company has discontinued its office at Webb City, and consolidated it with the Oronogo office.

Hall Land—McGee & Co. have opened up 18 ft. of high-grade silicate, at 95 ft. depth, on their 20-acre lease on this land south of Duenweg.

Hermit—This company has opened up ore at 112 ft. on its lease on the Granby land at Chitwood. The mill has been rebuilt.

Kelley Land—A good drill strike was made on this land, near the northeast corner of the Chautauqua ground at Carthage. Ore was found at 188 ft. depth.

McConnell—This company is opening up a 40-acre tract south of Duenweg. An 8-ft. face of silicate ore was found at 32 ft. depth.

Paragon—This company is sinking a shaft to open up the sheet ground on its 20-acre lease west of Joplin.

Tailings Mill—D. Cooper, C. J. Gunth and L. F. Roberts have bought the Water Oak mill, and are moving it to the West Side mine at Alba, to work the tailings.

Vantage—This company has started

two 11-in. pumps in the old cave near the Silver Dick. An incline is being built to run skips down into the cave.

Montana

Butte District

Parrot—In view of the fact that this company was the only one of the larger Butte concerns which failed to make any showing of net earnings in the recent annual reports, the strike in the Little Mina last week is of interest. The strike was made in a drift on the 1000-ft. level. Some years ago the mine was closed down as the result of litigation between the company and the Heinze interests, but was started again in 1906 when the fight between Heinze and the Amalgamated interests was settled. Since then the shaft has been sunk from the 800- to the 1000-ft. mark. The strike, while of no great importance, has revealed ore of a much higher grade than was formerly encountered.

Copper Eagle Mining Company—The property is located in the northern part of the Butte district, north of Walkerville. While no development work has been done recently, the shaft, down 225 ft., has been kept free from water and is in condition to resume operations at short notice. It is reported that negotiations are now being carried on to secure capital with which to sink to the 1000-ft. level. The upper levels have thus far shown silver ore, but no copper.

Amy-Silversmith—This mine, located in the silver belt of the Butte district northwest of Walkerville, is being worked by leasers. In times gone by several fortunes have been taken from the property, ores of which run high in gold and silver.

Butte Central & Boston Copper Company—Last week a petition was filed in the Federal Court by the creditors of the company asking that the company be adjudged bankrupt. For some time past there have been dissentions between the stockholders. The Tri-National company, of Boston, instituted suit against the company several months ago for the payment of a note for a considerable amount. The minority stockholders thereupon petitioned the court for permission to come in and defend the action, alleging in their petition that the company's directors were about to confess judgment. This suit is still pending. The company owns the Ophir mine, one of the oldest in the camp. Up to the time the company secured control, two years ago, this mine had been worked intermittently for silver ore, but it was thought that copper would be found with depth. The company has sunk the shaft from the 300- to the 500-ft. level, and has also installed a well equipped surface plant.

Davis-Daly—All leasers operating upon properties formerly owned by the Daly estate and now optioned to the Davis-Daly Estates Copper Company, have ceased work, pending a settlement of the financial difficulties of this company. The claims held under option from the Daly estate include the Silver King, Hesperus, Red Chief, Lizzie and Yellow Jack.

Beaverhead County

Polaris—Superintendent Harry Armstead states that arrangements are being made for the resumption of work about August 1. The mines and smelter have been closed down since last December.

Missoula County

Cape Nome Mining Company—The property of this company is located near Clinton. The Speculator Mining Company, former owner of the North Butte properties, owns the Black Hawk group of claims in the immediate vicinity of the Cape Nome, and has also secured an option on the claims which directly adjoin the latter. For the purpose of prospecting its own ground the Speculator company, according to a mutual agreement, sunk the Cape Nome shaft from the 300- to the 500-ft. level, whence it will run drifts into its own properties.

Nevada

Esmeralda County—Goldfield

Ore Shipments—The camp's production this week while maintaining the tonnage fell off a little in value, being 2061 tons valued at $148,315. The Western Ore Purchasing Company handled: Rogers Syndicate, 291 tons; Mushett lease, 200 tons; Little Florence, 73 tons; Engineers' lease, 222 tons; Oddie dump, 33 tons; Van Riper dump, 132 tons. The Nevada Goldfield Reduction Company treated: Jumbo, 149 tons; American mill tailings, 9 tons; Diamondfield Black Butte, 33 tons; Mohawk Combination, 33 tons; Sandstorm, 80 tons; Victor lease, 40 tons. Kendall lease shipped to Bonnie Claire mill 100 tons. The Combination mill treated 665 tons of Consolidated ores and made a special run on 30 tons which was valued at $60,000, which amount is not included in the above total.

Mohawk—In view of the reduction in freight and smelter rates the Mohawk is reported to be about to resume shipments of high-grade ores.

Mohawk Combination Lease—This lease has paid a dividend of $40,000, largely from the ore extracted during its last four days of existence. As soon as it disposes of its machinery and equipment the last of the famous Mohawk leases will have passed into history. This lease had quite a history. It was a union of the Kalfus lease on the Mohawk and the Sheets-Ish lease on the Combination. This latter lease was the cause of apex litigation between the Combination and Mohawk, which, however, was ended when both companies became part of the Consolidated. The Sheets-Ish people, however, took up the cudgel against the Kalfus lease and this was settled by the forming of the Mohawk Combination Leasing Company. When the lease had but four days left to run a serious cave occurred and the Consolidated shut the leasers from the premises and sued for damages. By agreement of both parties the matter was finally arbitrated, the Consolidated being awarded $9500 damages and the leasers being given four days to mine rock after a certain length of time granted for putting the workings in repair. A force of 120 picked men were put to work on three shifts and they extracted 900 tons of ore of an actual value of over $67,000 in the 96 hours allotted them.

Esmeralda County—Rawhide

Shipments have been made this week from the properties of the Rawhide Tiger, Coalition, Consolidated, Rector, and Queen. All the shipments were made by leasers.

Humboldt County

The San Francisco, Idaho & Montana railroad which is building from Caldwell, Idaho, to Winnemucca, has weathered the money stringency and is pushing work again. It is expected to start work northward from Winnemucca soon. This road will open up a rich mineral country.

Lander County

Austin Manhattan Consolidated Mining Company—This company has definitely outlined plans for its immediate future development. The 6000-ft. tunnel has already been cleaned out past the 2000-ft. station, and is being timbered by three shifts. The tunnel will be piped for ventilation and for compressed air and wired for electricity.

Nye County—Tonopah

Ore Shipments—The ore shipments over the Tonopah & Goldfield Railroad for the week ended June 25 to the Western Ore Purchasing Company, consisted of 90 tons from the Tonopah Extension. The Tonopah company sent 3550 tons, the Belmont company 700 tons, the Montana-Tonopah 1100 tons, the North Star 40 tons, the Midway 100 tons, the MacNamara 150 tons, and the West End 50 tons to the mills, making the total shipments for the week 5780 tons.

Tonopah Mining Company—At a meeting in Philadelphia this week the directors declared a dividend of 25c. per share, amounting to $250,000. It is stated semi-officially that similar dividends will be paid quarterly.

New York

Essex County

Cheever Mine—This iron mine, near Port Henry in the Lake Champlain district, has been closed down for the pres-

ent. About 75 men were employed at the mine.

Oklahoma

ZINC-LEAD DISTRICT

The Lincolnville district, south of Baxter, Kan., in Oklahoma, is pretty quiet, there being only three mills running. Eight miles southwest the Miami camp is booming. There are only four mills completed, but they are running full blast. This is the richest strike that has been made in this region. There are five more mills building and a sixth is to be bid on soon. The ore here seems to be more highly mineralized than that in the Lincolnville district, but it does not break so free from the gangue and so the mills are not making as good a recovery. A traction line is under consideration to run from the town to the mills, 5.5 miles. John Hall is the engineer in charge.

Pennsylvania

ANTHRACITE COAL

Lehigh & Wilkes-Barre Coal Company—A suit has been brought by the city of Wilkes-Barre and others, property owners, to enjoin this company from dumping culm into Solomon's creek, and to compel the company to dredge out the creek and remove obstructions already placed therein.

BITUMINOUS

Pittsburg-Buffalo Coal Company—This company has made an issue of $3,000,000 in 5-per cent. 30-year bonds. Of these bonds, $1,265,000 were used to retire old bonds outstanding; $735,000 to pay for new work and property; the remaining $1,000,000 being held to provide for future requirements.

BUTLER COUNTY

In the new McBride oilfield, the Hoffman No. 1 well, which was the first to draw attention to the field, is still flowing at the rate of 20 bbl. per hour. The Hoffman & Oesterling well, which gave only a small production at first, responded largely when shot. On June 30 a third well, the Shaffner, 125 ft. from the Hoffman, began to flow at the rate of 15 bbl. per hour. There is much excitement in the district, and preparations are being made to drill a number of wells.

South Dakota

CUSTER COUNTY

Hartford and Grand Junction—J. W. Van Leer, a mining engineer, has completed an examination of these two properties, which will probably be consolidated and operated jointly.

Minnie May—H. McClelland has had a number of men examining the property, and it is expected that announcement will shortly be made of a deal and resumption of work on the ground.

Wandering Boy—The owners have declined to extend the option to Wm. Gillespie, of Pittsburg, and no sale will be made.

Tennessee

SEVIER COUNTY

Details are being worked out for the construction of the Knoxville & Sevierville railroad, which will be about 26 miles long and will penetrate the heart of the Sevier county iron-ore field. The plans include the opening of mines on a considerable scale.

Virginia

Pocahontas Consolidated Collieries Company—An order has been entered in the United States Circuit Court at Lynchburg, Va., dismissing at plaintiffs' costs the suit instituted in that court on Jan. 14 last, by a minority of the preferred stockholders of the Pocahontas Collieries Company against this company. The Pocahontas Consolidated Collieries Company, Inc., a corporation of the State of Virginia, was formed through a merger on July 1, 1907, of a company of the same name with the Pocahontas Collieries Company, with a capitalization of $2,800,000 preferred stock and $4,520,000 common stock, and an authorized bond issue of $20,000,000. The terms of the merger provided that the preferred stockholders of the Pocahontas Collieries Company should accept, in exchange for their stock the new bonds of the merged company. This exchange not having been made by all the preferred stockholders of the Pocahontas Collieries Company, a suit was instituted by those who refused to make such exchange, for the purpose of securing an appraisement of their holdings under the Virginia laws, or as an alternative, a receivership for the merged company. This suit is now dismissed.

West Virginia

RALEIGH COUNTY

White Coal Company—This company is pushing the work of development on its coal mines near Beckley. Many of the surface buildings are complete, and a contract for sinking the shafts has been let to Patterson & McNeil. Work is progressing on the branch line from the Virginian railway up Shockley creek to the mines. The company has an 11-ft. vein of coal at 280 ft. depth.

Wisconsin

ZINC-LEAD DISTRICT

Further curtailment of zinc ore and increased production of lead ore are noticeable. The zinc-ore output of this district for the first six months of 1908 falls short only about 3000 tons of the figures for the corresponding period of 1907. During the first three months of this year the weekly average remained at 500 tons; in spite of continued restriction of output in many quarters, however, the production during the last three months has steadily increased and shows as large a total (13,334 tons) as any equal period in the history of the district. Moreover, the average grade of zinc ore now shipped out is considerably higher than was formerly the case.

Canada

BRITISH COLUMBIA—BOUNDARY DISTRICT

British Columbia Copper—Some additional details have been published regarding the operations for the fiscal year ended Nov. 30 last. It appears that the company in that time produced from its smelter, 8,643,133 lb. of copper, 101,114 oz. silver, and 24,967 oz. gold, for which it received a total of $2,159,414. The copper was sold for 17.52c. per lb. Excluding the loss occasioned by the rapid decline in the price of copper, it would appear that the cost of production was about 13c. The first car of blister copper since production was resumed was shipped on June 8, and since then the converters have been turning out nearly a car a day. The mines have been producing 11,500 to 12,000 tons weekly, which would supply the smelter at nearly its full capacity of 2000 tons daily.

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending June 27, were as follows: Buffalo, 42,680 lb.; Coniagas, 63,210; City of Cobalt, 116,400; Drummond, 40,000; McKinley-Darragh, 58,120; Nipissing, 62,400; O'Brien, 63,320; Right-of-Way, 60,480; Temiskaming, 120,000; Trethewey, 133,500; Watts, 60,160; total, 820,270 pounds.

Africa

RHODESIA

Gold production in May is reported 53,188 oz. fine, being 2470 oz. more than in April. For the five months ended May 31 the total was 251,083 oz., or $5,189,886. For the corresponding period in 1907 the total was 236,857 oz.; but the comparison is not accurate, as last year the reports were made in bullion, but this year nearly all the companies report in fine gold.

Other production reported for May was: Silver, 28,025 oz.; copper, 9 tons; lead, 113 tons; chrome ore, 556 tons; coal, 14,432 tons.

Europe

RUSSIA

A terrible explosion has occurred in the Rikovski coal mine near Yusovo, in the Donetz basin. The explosion was of gas, according to the accounts sent by cable, and the force was very great, many of the bodies recovered being badly torn and mutilated. The cable reports say that 267 dead bodies were taken out by the rescue parties, and 150 men were still in the mine when further work was stopped by fire in the mine, started by the explosion. It is hardly possible that any will be found alive, so that the loss of life was over 400 in all.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 8—The coal trade in the West shows some signs of improvement. In Indiana the mines are more active and there seems to be a better demand for coal. There are also better reports from other quarters, and some manufacturing concerns are starting up, increasing the call for steam coal. The mines everywhere are running rather slack, but with no interruption from labor troubles.

In the East the bituminous trade is very quiet, with small demand reported in most places. Midsummer dullness has settled down on the anthracite trade, and there is little doing. The Coastwise trade is the lightest known for years, and many vessels are going out of commission.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania Railroad lines east of Pittsburg and Erie, year to June 27, in short tons:

	1907.	1908.	Changes
Anthracite.....	2,837,134	2,689,901	D. 147,233
Bituminous.....	18,735,831	15,690,393	D. 3,045,438
Coke.....	6,986,112	3,298,115	D. 3,687,997
Total.....	28,559,077	21,678,409	D. 6,880,668

Total decrease this year to date has been 24.1 per cent.

Shipments of Broad Top coal over the Huntingdon & Broad Top road for the year to June 27 were 290,913 long tons; a decrease of 206,711 tons from the first half of last year.

New York

ANTHRACITE

July 8—The market for hard coal is dull and inactive and sales are light. The Lake traffic shows signs of starting up in earnest. The independent dealers continue to cut prices 15@20c. below the circular for both prepared and small steam coal.

Prices are as follows: Broken, $4.55; egg, stove and chestnut, $4.80; pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor.

BITUMINOUS

There is no activity in the soft-coal market and the only business seems to be among those consumers who must lay in large winter stocks. In New York harbor trade is at a standstill and good grades of steam coal fetch $2.45@2.50 with few takers.

Transportation from mines to tide is fair. In the Coastwise vessel trade there is little disposition to charter at the present rates. Freight rates are unchanged, as follows: To Boston, Salem and Portland, 50@55c.; Lynn, 55@60c.; Saco, 90c.; Newburyport, 75c.; Portsmouth, 55@60c.; Bath, 60@65c.; Gardiner, 65c.; Bangor, 70@75c.; to the Sound, 45@50c.; towages where usual.

Birmingham

July 7—The coal production in Alabama has been reduced some by the closing down of the commercial coal mines, the contract with the union miners having expired. The commercial operators have demanded of the miners that they be allowed the same mining wage as that which is paid at the non-union mines, 47½c. per ton, while the union miners have offered a flat rate for the year of 55c. per ton. A strike will probably be called this week. The union has between 3500 and 4000 members. There is a steady output at the non-union mines. None of the iron manufacturing companies in the Birmingham district recognizes the union, and there is a belief expressed that the commercial coal operators will now give the men a fight, the object being to drive the union from the mines of the State.

Coke shows a little improvement with the production about the same as reported two weeks ago.

Chicago

July 6—The coal market is in its usual summer condition, sales being light and fine coals in demand. Western coals especially run to fine sizes in general demand.

Standard quotations are: Illinois and Indiana lump or egg, $1.75@2.25; run-of-mine, $1.55@1.75; screenings, $1.50@1.65. Some lump is down to $1.60, and is not easily sold.

Eastern coals are weak. Smokeless and Hocking are 15@25c. under circular quotations with sales light and receipts heavy. Youghiogheny on contracts is firm at $3.15 for ¾-in. Anthracite is dull.

Indianapolis

July 6—The beginning of the second half of the year finds the coal-mining industry in an improved condition. The situation has been clarified by the settlement of the wage question, mine rules and the equalization of joint freight rates on several of the coal-carrying roads. The market has an encouraging outlook. On the whole the volume of orders at the mines is larger than for several years this early in the summer trade. The railroads have begun hauling large quantities of Indiana coal to dealers and consumers within and outside of the State. A slight increase in the price of coal at the mines, due to the increased cost of mining, is also assigned as a cause of better trade with dealers who wish to store a supply before another increase is made.

Pittsburg

July 7—About 80 per cent. of the railroad coal mines in the Pittsburg district are in operation and the bulk of the product is going to Lake ports for the northwestern markets. There is little local demand. Prices continue firm on the basis of $1.15 a ton for mine-run coal at mine. No shading is being done, as operators declare lower prices would not bring out any more business. Nearly all of the river mines are running and the coal is being loaded for a rise. Slack is a drug on the market. The large producers are still quoting it at 75c., but no sales are recorded that that price. What little was sold during the week went at considerably less, as low as 40c. being paid in some instances.

Connellsville Coke—There are strong indications of an improvement in the coke trade and operators are busy looking for men to take the places of the workers who left the fields when the depression came last fall. Many inquiries have been received during the past few days. Prices remain firm, furnace coke being quoted at $1.65@1.75 and foundry at $2.10@2.25 a ton at ovens. The *Courier* in its weekly report gives the production in both fields at 164,839 tons. The shipments were 6469 cars as follows: To Pittsburg, 2549; to points west of Connellsville, 3450; to points east of Connellsville, 470 cars.

Foreign Coal Trade

United States Coal Exports—Exports of coal and coke from the United States five months ended May 31, long tons:

	1907.	1908.	Changes.
Anthracite.....	966,877	1,047,427	I. 80,550
Bituminous.....	3,463,013	3,034,870	D. 428,143
Total coal.....	4,429,890	4,082,297	D. 347,593
Coke.....	348,680	297,843	D. 50,837

Exports do not include coal furnished to steamships in foreign trade. Canada took this year 2,973,393 tons of coal, or

72.8 per cent. of the total. The coke went chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, five months ended May 31, long tons:

	1907.	1908.	Changes.
Anthracite	13	15,023	I. 15,010
Bituminous	799,731	704,848	D. 94,883
Total coal	799,744	719,871	D. 79,873
Coke	62,352	52,181	D. 10,171

Canada furnished this year 445,489 tons of coal and nearly all the coke; Australia, 218,284 tons of coal. The greater part of the imports are on the Pacific Coast.

Welsh Coal Trade—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices at Welsh ports as follows, under date of June 27: Best Welsh steam, $3.90; seconds, $3.66; thirds, $3.54; dry coals, $3.84; best Monmouthshire, $3.36; seconds, $3.30; best small steam, $2.28; seconds, $2.10. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, July 8—The present month is almost always a dull one, and it was to be expected that this year it would be duller than ever. There has been nothing new during the week, and no tendency in either direction can be detected. Matters have been simply drifting.

There has been some buying of pig iron, but in such small quantities that it would be hardly noticed in ordinary times. In finished material also, very little is doing. A few contracts for structural work are pending, but there is a disposition to hold back, probably because better prices are expected.

Judge Gary, of the Steel Corporation, has sailed for Europe, and it is hardly probable that any positive action about price changes will be taken in his absence.

Birmingham

July 6—The second half of the year starts off with the demand quiet, quotations firm, and the shipments of pig iron quite active. The stocks of iron on hand are being reduced steadily. The demand is in small lots and the inquiry is a little slack. The production is about 70 per cent. normal with preparations being made to improve these conditions. The iron quotations in the Birmingham district range between $12 and $12.25 per ton, No. 2 foundry, with carload lots, immediate delivery, bringing as high as $12.50. The home consumption is increasing. The resumption of operations this week at the rolling mills of the Tennessee Coal, Iron and Railroad Company at Bessemer, Ala., is the feature of the week. As far as possible, employment was given to the old labor. The steel plant of the Tennessee company at Ensley is doing well. The foundry of the United States Cast Iron Pipe and Foundry Company at Anniston, has been started up and will be followed shortly by other departments of the industry until the whole plant has been put back to work.

Chicago

July 6—The iron market continues quiet, with a few large inquiries but nothing to indicate sudden change from the condition of steady buying for needs of the next three months, chiefly in lots of a carload to 500 tons.

Northern iron is firm at $17@17.50 and Southern at $12@12.50 Birmingham ($16.35@16.85 Chicago) for No. 2. The demand for Northern is fairly steady; for Southern it is erratic but averages fair. Southern iron for delivery within 30 days is sold at a cut price of 25 or 50c., but the market generally holds to the $12 minimum.

For iron and steel products the market generally is dull. Coke is selling well on contracts and rather lightly on spot requirements, with the best Connellsville at $4.90, Chicago.

Cleveland

July 7—The ore movement is still slow, the total for July being about 2,500,000 tons, or 10,000,000 tons less than last year. The shipments from docks to furnaces are also slow. Vessel capacity to move about 700,000 tons from Lake Superior ports has been contracted for at 65c., which is 10c. below last year's rate. Even 60c. has been reported, but not confirmed.

Philadelphia

July 7—The immediate outlook of the pig-iron industry has improved even with the intervention of a holiday. The features are, declining furnace stocks, increasing third-quarter requirements and an increase in actual consumption needs. Prices are steady. No. 2X runs close to $16@16.50; gray forge, $16 and basic the same.

Billets—The low prices have stirred up some correspondence with large consumers.

Bars—The average business is done at 1.40@1.50c. Some business is in sight in car lots.

Sheets—The reports given today show no change. The larger consumers will not place orders until there is a stronger incentive than at present.

Pipes and Tubes—There is more preparation of stock in some departments of the locomotive works. The boiler shops are working slack.

Plates—The Pennsylvania plate mills are not booking new business of importance. A moderate amount of county bridge work is coming along.

Structural Material—No mid-summer improvement is in sight. So far as city and near-by demand is concerned it is not worth noting.

Rails—Traction roads are ordering some rails for quick delivery. Repairing requirements for traction lines are larger this year than ever before. Light rails are also called for irregularly.

Old Material—The larger scrap dealers take a more hopeful view, though actual sales are trifling. They have had some intimations which have started two or three of them on the hunt for heavy steel scrap, which is quoted this week 50c. higher.

Pittsburg

July 7—The situation looks a little better this week and there are signs of a gradual improvement. Reports of a decided betterment of conditions in the Pittsburg district that have been sent out by prosperity wishers have no foundation, though it is true that additional mills have been put in operation at some of the plants of the Carnegie Steel Company. The placing of 35,000 tons of steel rails by the Baltimore & Ohio Railroad last week is regarded as a starter for rail buying.

All the independent sheet and tinplate makers have accepted the wage scales arranged by the Amalgamated and the leading producer. The only scale not adjusted is for the iron workers. The Amalgamated opened a conference in Detroit today with the Western Bar Iron Association. It is expected that a settlement will be reached and also that later the Republic Iron and Steel Company, which rejected the proposition of the Amalgamated will reopen negotiations. No one anticipates any labor troubles this year. The chief desire of everyone seems to be to get the mills started on a long, steady run.

Small orders continue to be placed in nearly every line and prices are being firmly maintained. Since the cut of $4 a ton was made in steel bars, contracts were closed aggregating fully 600,000 tons. This tonnage seems large, but the bulk of it is for deliveries extending over a period of one year.

Pig Iron—Some shading has been done by a Valley merchant-furnace interest. The sale of 200 tons reported last week as off-bessemer iron at $15.75 was really standard bessemer. It is reported that a sale of 300 tons also was made at that figure. Other Valley furnace interests are holding firmly for $16 for third quarter and $16.25 for last quarter. Malleable bessemer, basic and No. 2 foundry for early delivery are quoted at $15. Gray forge is firm at $14, Valley furnaces.

Steel—The crude-steel market continues dull, but prices are firm. Both bessemer and open-hearth billets are quoted at $25, Pittsburg. Steel bars are 1.40c. and plates 1.60c.

Sheets—Conditions remain unchanged and black sheets are still quoted at 2.50c. and galvanized at 3.55c. for No. 28 gage.

Ferro-Manganese—There is an improved demand and indications point to

higher prices before the end of this quarter. For prompt delivery at Pittsburg prices range from $46 to $47 per ton.

Foreign Iron Trade

German Iron Ore Trade—Imports and exports of iron ore in Germany for the four months ended April 30 were, in metric tons:

	1907.	1908.	Changes.
Imports	2,077,040	1,939,283	D. 137,757
Exports	1,443,134	1,171,759	D. 271,375

Imports are from Spain, Sweden and Russia. Exports are chiefly of minette ores from Luxemburg to Belgium and France.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, July 8.
At all U. S. Ports in May and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1908..	$26,555,913	$ 3,069,402	Exp. $23,486,511
" 1907..	4,505,444	2,682,163	" 1,823,281
Year 1908..	44,891,257	22,926,623	" 21,964,634
" 1907..	12,428,592	19,303,305	Imp. 6,874,713
Silver:			
May 1908..	4,028,334	3,362,176	Exp. 666,158
" 1907..	4,326,216	3,563,096	" 763,120
Year 1908..	21,077,185	17,660,753	" 3,416,427
" 1907..	23,858,610	18,919,06	" 4,939,545

Exports from the port of New York, week ended July 4: Gold, $305,343, principally to Germany; silver $380,928, chiefly to London. Imports: Gold, $130,611; silver, $69,468, both from the West Indies, Central and South America.

Specie holdings of the leading banks of the world July 4, are reported, as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$306,623,600
England	$183,036,965	.....	183,036,965
France	628,643,015	$188,530,840	817,173,855
Germany	178,440,000	73,950,000	252,390,000
Spain	78,075,000	134,920,000	212,995,000
Netherlands	38,517,500	21,373,000	59,890,500
Belgium	20,753,335	10,376,665	31,130,000
Italy	181,125,000	21,500,000	202,625,000
Russia	558,610,000	38,440,000	597,050,000
Aust.-Hungary	234,420,000	66,965,000	301,385,000
Sweden	19,430,000	.....	19,430,000
Norway	7,265,000	.....	7,265,000
Switzerland	18,170,000	.....	18,170,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Silver Market

SILVER AND STERLING EXCHANGE.

July.	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.	July.	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.
2	4.8695	53¾	24 13/16	6	4.8695	54	24⅞
3	4.8695	53¾	24 13/16	7	4.8695	53¾	24 13/16
4	.....	....	24 13/16	8	4.8695	53¼	24 7/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to June 25:

	1907.	1908.	Changes.
India	£6,049,924	£3,929,158	D. £2,120,766
China	.....	516,400	I. 516,400
Straits	544,012	90,510	D. 453,502
Total	£6,593,936	£4,536,068	D. £2,057,868

Receipts for the week were £178,500 from New York. Exports were £2000 to Egypt and £103,500 to India; £105,500 in all.

Indian Exchange continues steady at 15.91d. per rupee, with sales of 10 lakhs of Council bills in London.

The silver market has remained fairly steady during the past week at 24 13/16d. in London, but closes lower at 24 9/16d., on speculative sales in London.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

July.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
2	12⅝ @12¾	12⅜ @12⅝	56½	27⅛	4.42½ @4.45	4.45 @4.50	4.30 @4.35
3	12⅝ @12¾	12⅜ @12⅝	56⅝	27⅜	4.42½ @4.45	4.45 @4.50	4.30 @4.35
4	.....	.....	.....	.....	.....	.....	.....
6	12¾ @12⅞	12½ @12⅝	57⅛	27½	4.42½ @4.45	4.40 @4.45	4.25 @4 30
7	12¾ @13	12½ @12⅝	57¼	27⅝	4.42½ @4 45	4.40 @4.45	4.25 @4 30
8	12¾ @13	12½ @12⅝	57½	28⅛	4.42½ @4.45	4.40 @4 45	4.27½ @4.32½

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The better feeling on the part of American consumers reported in our last issue found continued expression this week in the transaction of considerable business, and it is particularly noteworthy that purchases have not, as heretofore, been restricted to early deliveries. The European consumers, too, have come again into the market. The demand was freely met by some of the producers so that prices as yet show little change, but that little is for the better. The market closes at 12¾@13c. for Lake, 12½@12⅝c. for electrolytic in cakes, wirebars or ingots. The average of the week for casting copper has been 12¼@12½c., the market being 12⅜@12½c. at the close.

The standard market in London has been strong and advancing, closing at £57 10s. for spot and £58 5s. for three months, or over £1 higher than last week. A large business was done.

For refined and manufactured sorts we quote: English tough, £60@61; best selected, £60@61; strong sheets, £72@73.

Exports of copper from New York and Philadelphia for the week were 6921 long tons. Our special correspondent gives the exports from Baltimore at 406 long tons.

Manufactured Copper—Sheets, cold-rolled, 18c.; hot-rolled, 17c. Wire, 14¾c. base.

Tin—In sympathy with the copper market, tin has had quite a good advance in London, where it closes at £127 5s. for spot and £128 5s. for futures, which is equal to an advance of £3 10s. from the low point reached. The New York market has closely followed the trend of that of London, with the exception of spot tin, which is again being concentrated, and for which a slight premium is obtained. Quotations are made at the close at about 28 @28¼c. per pound.

Shipments of tin from the Straits, four months ended April 30: United States, 2689; Great Britain, 12,960; other Europe, 3017; India and China, 822; total, 19497 long tons, an increase of 1748 tons over last year.

Visible stocks of tin reported on July 1, long tons:

	In Store.	Afloat.	Total.
London	5,051	4,166	9,217
Holland	593	183	776
U. S., exc. Pacific ports	1,543	2,619	4,162
Total	7,187	6,968	14,155

The total shows a decrease of 1269 tons from the June report.

Lead—The demand for this article is good, but it continues to be supplied by speculators who bought at lower prices. Business is being done at 4.42½@4.45c. New York.

A better demand has developed abroad at the lower prices which were recently established. The market closes strong, with Spanish lead at £12 15s. and English lead at £12 17s. 6d. per ton.

Spelter—The market remains sluggish, and prices went off to 4.25@4.30, St. Louis, but at the close there was a little improvement, business having been done at 4.27½@4.32½c. St. Louis.

The European market, also, has declined somewhat, good ordinaries being quoted at £18 and specials at £18 15s. per ton.

Zinc Sheets—Base price is 7c., f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—No sales have been reported, and the market is without interest. Prices remain unchanged at 8⅝@8¾c. for Cookson's, 8¼@8½c. for Hallett's and 8@8¼c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base. Foreign metal is offered at rather lower prices.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is $44 per flask for large lots; $45 for jobbing orders. San Francisco, large lots nominal at $43.50, domestic, and $42, export; small orders, $45@46. London is £8 per flask, with £7 17s. 6d. quoted by second hands.

Platinum—Prices remain unchanged at $23.50 per oz. for hard platinum, $21 for ordinary and $16 for scrap.

Imports and Exports of Metals

Exports and imports of metals in the United States for the five months ended May 31 are reported as follows, in the measures usual in the trade:

	Exports.	Imports.	Balance.
Copper, long tons	139,793	30,461 Exp.	109,332
Copper, 1907....	65,179	53,793 Exp.	11,386
Tin, long tons....	130	14,693 Imp.	14,563
Tin, 1907.....	141	17,725 Imp.	17,584
Lead, short tons.	33,313	47,429 Imp.	14,116
Lead, 1907.....	10,345	32,248 Imp.	21,903
Spelter, sh. tons.	1,555	338 Exp.	1,217
Spelter, 1907....	304	479 Imp.	175
Nickel, lb.....	5,388,855	6,089,531 Imp.	700,676
Nickel, 1907....	4,784,163	8,265,284 Imp.	3,481,121
Antimony, lb.....	.....	3,261,495 Imp.	3,261,495
Antimony, 1907.	.....	4,361,187 Imp.	4,361,187
Platinum, lb.....	... .	1,198 Imp.	1,198
Platinum, 1907.	.....	3,436 Imp.	3,436
Quicksilver, lb...	83,874	..... Exp.	83,874
Quicksilver, '07	223,338	..... Exp.	223,338
Aluminum, value	$162,681	..... Exp.	$162,681
Aluminum, 1907	131,147	..... Exp.	131,147

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. Zinc ores exported were 8071 tons in 1907, and 12,669 tons in 1908; zinc dross, 10,757,810 lb. 1907, and 10,599,983 lb. in 1908. Zinc ores imported this year, 7362 tons calamine and 6772 other ores, 14,134 tons in all; not reported in 1907. Antimony ores imported, 1,289,801 lb. in 1907, and 416,747 lb. in 1908. Exports given above include re-exports of foreign material.

Wisconsin Ore Market

Platteville, Wis., July 4—The highest price paid for zinc ore this week was $36, the base price ranging from $34 to $36 per ton of 60 per cent. zinc. The low and intermediate grades, comprising nearly the whole of the week's production, sold on the lower base. The scarcity of high-grade ore caused the advance for the better grades. Lead ore sold as high as $64 per ton.

Shipments from district, week ended July 4:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Highland.....	371,900	.....	.....
Platteville.....	223,600	.....	226,735
Benton.....	160,960	.....	.....
Days Siding.....	88,000	.....	.....
Cuba City.....	69,560	175,740	.....
Livingston.....	50,000	.....	.....
Strawbridge.....	.....	48,550	.....
Total.....	964,020	224,290	226,735
Year to July 4.....	43,869,465	5,270,015	308,665

Hazel Green shipped about 600,000 lb. zinc ore and one or two cars of lead ore, the exact figures of which will be reported next week.

In addition to the above there was shipped to the electrostatic separator at Platteville, from Benton, 215,600 lb.; from Dodgeville, 78,300 lb.; shipped to the Joplin Separator Works at Galena, from Rewey, 67,000 lb.; shipped to the Enterprise roaster at Platteville, from Strawbridge, 206,300 lb. zinc ore.

Missouri Ore Market

Joplin, Mo., July 4—The highest price paid for zinc ore was $38 per ton, the assay base price ranging from $34 to $35.50, and the average price for all grades being $31.30, with a large silicate shipment. The highest price for lead ore was $65.50 in the bin, or $66 f.o.b., paid on deliveries of the previous week purchases, with week end offerings light at $62. The average all grades was $61.92 per ton. One sale of zinc for next week's delivery was made on a base price of $36 per ton.

On account of the Fourth of July every mine lost one day during the past week, and it is impossible to ascertain what mines will resume operations on Monday, there being so much undercurrent talk of a restricted output for two weeks.

Following are the shipments of zinc and lead from the various camps of the district for the week ending July 4:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	1,622,670	486,510	$41,043
Joplin.....	1,844,450	245,760	39,433
Galena.....	441,190	295,490	16,219
Prosperity	420,740	106,070	10,019
Alba-Neck.....	578,850	.....	9,839
Duenweg.....	621,330	68,560	9,479
Granby	476,920	34,170	7,500
Miami.....	350,560	68,780	6,912
Aurora.....	433,210	9,580	6,412
Badger.....	220,190	.....	3,853
Oronogo.....	135,860	44,660	3,833
Cave Springs.....	200,270	.....	3,404
Carthage.....	128,760	.....	2,252
Spurgeon.....	144,500	28,920	2,221
Carl Junction.....	60,630	16,690	1,546
Sarcoxie.....	60,500	.....	726
Totals	7,740,630	1,405,190	$164,691
27 weeks.....	248,011,310	38,682,430	$5,249,593
Zinc value, the week, $121,180; 27 weeks,			$4,210,621
Lead value, the week, 43,511; 27 weeks,			1,038,972

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1907.	1908.	Month.	1907.	1908.
January ...	45.84	35.56	January ...	83.58	46.88
February ..	47.11	34.92	February ..	84.58	49.72
March	48.66	34.19	March	82.75	49.90
April.....	48.24	34.08	April.....	79.76	52.47
May.....	45.98	33.39	May	79.56	56.05
June.....	44.82	32.07	June	73.66	60.48
July.....	45.79	.....	July.....	58.18	.....
August.....	43.22	.....	August.....	59.54	.....
September.	40.11	.....	September.	53.52	.....
October ...	39.83	.....	October	51.40	.....
November..	35.19	.....	November	43.40	.....
December..	30.87	.....	December	37.71	.....
Year.....	43.68	.....	Year	68.90	.....

Chemicals

New York, July 8—The market is quiet, but steady, and shipments have been light. There is little interest being taken.

Copper Sulphate—The market is quiet and dealers are conservative. It is reported that outside goods have been offered at $4.50 per 100 lb. Standard sulphate remains unchanged at $4.65 per 100 lb. for carloads and $4.20 for smaller lots.

Exports of copper sulphate from the United States five months ended May 31 were 5,656,755 lb. in 1907, and 6,404,042 lb. in 1908, an increase of 747,287 lb. this year.

Phosphates—Exports of phosphates from the United States, five months ended May 31, long tons:

	1907.	1908.	Changes.
Crude	394,933	526,989	I. 132,056
Other.....	12,778	11,559	D. 1,219
Total.....	407,711	538,548	I. 130,837

The principal exports this year were to Germany, Great Britain and France.

Nitrate of Soda—Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on July 1 as follows, in long tons:

	1907.	1908.	Changes.
Stocks, Jan. 1.....	13,050	5,900	D. 7,150
Arrivals, 6 months.....	133,045	124,950	D. 8,095
Total Supplies.....	146,095	130,850	D. 15,245
Deliveries, 6 months....	144,595	120,170	D. 24,425
Stocks, July 1.....	1,500	10,680	I. 9,180
Afloat for U. S.....	120,000	60,000	D. 60,000

Quantities afloat include all cargoes due to arrive at United States ports by Oct. 15 next.

Sulphur—Imports of sulphur and pyrites into the United States, five months ended May 31, long tons:

	1907.	1908.	Changes.
Sulphur.....	4,606	13,218	I. 8,612
Pyrites.....	134,845	176,817	I. 41,972
App. total sulphur.....	58,544	83,945	I. 25,401

Exports of sulphur for the five months, 2905 tons in 1907, and 5512 in 1908; increase, 2607 tons.

Heavy Chemicals—Imports of heavy chemicals into the United States five months ended May 31, in pounds:

	1907.	1908.	Changes.
Bleaching powder	50,318,361	29,272,476	D. 21,045,885
Potash salts.....	92,357,497	68,232,383	D. 24,125,114
Soda salts.....	9,916,075	4,627,256	D. 5,288,819

Exports of acetate of lime for the five months, 40,477,042 lb. in 1907, and 26,288,641 lb. in 1908; decrease, 14,188,401 lb. this year.

Mining Stocks

New York, July 8—The general stock market took on some improvement after the holiday. It has been largely professional still, and the gain has been rather in quotations than in the volume of business.

The curb market in New York has been rather irregular, but stronger on the whole. There was more trading in copper shares, but it was confined to a few favorite stocks; these generally showed advances in price.

Conditions are rather favorable for speculation, so far as the money market is concerned; but the extreme heat, the vacation season among operators and

political uncertainties are on the other side.

Boston

July 7—A feeling of optimism pervades the air relative to mining shares, although it is not manifest to any great extent so far as prices are concerned. There has been material strength for the past 10 days or so, and although the volume of business has not been large, it is attracting attention. So far it is only sentimental.

The advance of Osceola to $106 supplied the incentive for a broadening interest in Lake stocks. The $2 dividend declaration lends encouragement, although the stock has fallen back to $100 in the mantime. There have been rumors of settlement or compromise of the Bigelow-Calumet & Hecla litigation, but so far there is nothing to it.

Amalgamated shows good strength, having risen $2.50. The declaration of the regular Anaconda dividend does not indicate any change in the former's rate. North Butte has been fairly active and rose $3 to $69. Utah Consolidated rose $1.50 to $42.50. Copper Range has been steady at from $72.50 to $73.25.

The curb is becoming more active and at better prices.

Salt Lake City

July 2—The volume of business transacted on the Salt Lake Stock and Mining Exchange in June broke all previous records. Sales for the month reached a total of 4,666,519 shares; the selling value of which was $2,848,580 in all.

STOCK QUOTATIONS

NEW YORK	July 7
Name of Comp.	Clg.
Alaska Mine	3/32
Amalgamated	68
Anaconda	43
Balaklala	‡3/16
British Col. Cop.	4 3/4
Butte & London	
Butte Coalition	22 3/32
Colonial Silver	1/2
Cum. Ely Mining	7 1/8
Davis Daly	1 7/8
Dominion Cop	1 15/16
Douglas Copper	4
El Rayo	2
Florence	3 1/16
Foster Cobalt	41
Furnace Creek	.14
Giroux	3 1/2
Gold Hill	7/16
Goldfield Con	5 1/2
Granby	‡96
Greene Gold	3/4
Greene G. & S	.25
Greenw'r & D.Val.	.75
Guanajuato	1 3/4
Guggen. Exp.	150
Hanapah	‡.20
McKinley Dar.	75
Micmac	2 3/8
Mines Co. of Am.	1 1/2
Mitchell Mining	1/4
Mont. Sho.C	.68
Nev. Utah M. & S	3 1/8
Newhouse M. & S	5 1/4
Nipissing Mines	7 3/4
Old Hundred	1/2
Silver Queen	1.06
Stewart	1 1/4
Tennessee Cop'r.	35 7/8
Tri-Bullion	1 5/8
Union Copper	3/4
Utah Apex	3 3/4
Utah Copper	34
Yukon Gold	3 3/4

*Ex. Div. †Ex. Rights.

BOSTON	July 7
Name of Comp.	Clg.
Adventure	4 1/8
Allouez	29 3/4
Am. Zinc	28
Arcadian	3 1/4
Arizona Com	18 1/2
Atlantic	14
Bingham	.30
Boston Con	12 1/4
Calumet & Ariz	110
Calumet & Hecla	655
Centennial	25 1/2
Con. Mercur	.39
Copper Range	72 1/2
Daly West	10 3/4
Franklin	9 1/2
Greene-Can	10 3/4
Isle Royal	20 1/4
La Salle	14 1/2
Mass	5
Michigan	9 3/4
Mohawk*	59 1/2
Nevada	12
North Butte	68 3/4
Old Colony	‡.25
Old Dominion	35 1/2
Osceola	101
Parrot	24 1/2
Quincy	87
Rhode Island	3 1/4
Santa Fe	1 3/4
Shannon	13 3/4
Superior	16 5/8
Tamarack	64 1/2
Trinity	13 1/2
United Cop., com.	7
U. S. Oil	24 3/4
U. S. Smg. & Ref*.	35 3/4
U.S.Sm. & Re.,pf*.	42 1/4
Utah Con*	42
Victoria	4 5/8
Winona	5 1/2
Wolverine	134
Wyandotte	1 1/4

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	24 1/4
Am. Smelt. & Ref.	80 3/8
Am. Sm. & Ref., pf.	102 1/2
Bethlehem Steel	‡13 1/2
Colo. Fuel & Iron	28 1/2
Federal M. & S.,pf.	81
Inter. Salt	18 1/2
National Lead	67 1/8
National Lead, pf.	100
Pittsburg Coal	12 7/8
Republic I. & S.	18 1/4
Republic I. & S.,pf.	68 1/4
Sloss-Sheffield	54 3/4
Standard Oil	605
U. S. Red. & Ref.	‡10
U. S. Steel	39 1/8
U. S. Steel, pf	105 1/2
Va. Car. Chem	24

BOSTON CURB	
Ahmeek	72
Black Mt	3 3/4
East Butte	‡5 3/4
Hancock Con	‡5 7/8
Keweenaw	‡6 3/8
Majestic	.56
Raven	.98
Shawmut	.41
Superior & Pitts.	11 7/8
Troy Man	‡.40

ST. LOUIS	July 3	
N. of Com.	High.	Low.
Adams	.30	.20
Am. Nettie	.03	.02
Center Cr'k	2.00	1.50
Cent. C. & C.	68.00	67.00
C.C. & C. pd.	78 00	76.00
Cent. Oil	110 00	100.00
Columbia	4.00	3.00
Con. Coal	18.00	16.00
Doe Run	120 00	110.00
Gra. Bimet.	.25	.20
St. Joe	15.00	12.00

LONDON	July 8
Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 1 6
Camp Bird	0 13 0
Esperanza	1 11 3
Tomboy	1 7 6
El Oro	1 6 3
Oroville	0 10 6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. July 8.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.15½
Belcher	.19	St. Ives	.23
Best & Belcher	.50	Triangle	.03
Caledonia	.07	BULLFROG STOCKS	
Challar	.15	Bullfrog Mining	.03
Comstock	‡ 30	Bullfrog Nat. B	.04
Con. Cal. & Va	.56	Gibraltar	.03
Crown Point	.24	Gold Bar	.03½
Exchequer	.15	Homestake King	.40
Gould & Curry	.12	Montgomery Mt.	.06
Hale & Norcross	.20	Mont. Shoshone C.	.64
Mexican	.42	Original Bullfrog	.01
Ophir	2.40	Tramp Cons	.15
Overman	.08	MANHAT'N STOCKS	
Potosi	.08	Manhattan Cons.	.08
Savage	.21	Manhat'n Dexter	.05
Sierra Nevada	.21	Jumping Jack	.04
Union	.27	Stray Dog	.03
Utah	.02	MISCELLANEOUS	
Yellow Jacket	.35	Golden Boulder	.07
TONOPAH STOCKS		Bonnie Clare	.05
Belmont	.87½	Lee Gold Grotto	
Extension	.68	Nevada Hills	1.50
Golden Anchor	.01½	Nevada Smelting	.75
Jim Butler	.22	Pittsburgh S. Pk.	1.05
MacNamara	.33	Round Mt. Sphinx	26
Midway	.36		
Montana	1.35		
North Star	.06		
Tono'h Mine of N.	7.87½		
West End Con	.60		
GOLDFI'D STOCKS			
Adams	.03		
Atlanta	.16		
Booth	.15		
Columbia Mt	.13		
Comb. Frac	.59		
Cracker Jack	.04		
Dia'dfield B. B. C.	.17		
Goldfield Belmont	.14		
Goldfield Daisy	.81		
Great Bend	.26		
Jumbo Extension	.40		
Katherine			
Kendall	.13		
Lone Star	.06		
May Queen	.05		
Oro	.08		
Red Hill	.17		
Roanoke			
Sandstorm	.25		

COLO. SPRINGS	July 3
Name of Comp.	Clg.
Acacia	5 3/4
Black Bell	
C. C. Con	2 7/8
Dante	5
Doctor Jack Pot	6 1/4
Elkton	56 1/4
El Paso	33
Findlay	24 1/8
Gold Dollar	6 1/4
Gold Sovereign	‡3
Isabella	30
Index	
Jennie Sample	‡3
Jerry Johnson	‡4 1/8
Mary McKinney	25
Pharmacist	‡3 1/4
Portland	1.06
Un. Gold Mines	3 1/2
Vindicator	84 3/4
Work	8 1/2

Assessments

Company.	Delinq.	Sale.	Amt.
Birchville, Cal	June 20	July 11	$0.02
Bullion, Nev	June 25	July 17	0.05
Butler-Liberal, Utah	July 17	Aug. 6	0.02
Chollar, Nev	July 8	July 30	0.10
Con. Imperial, Nev	June 17	July 9	0.01
Con. Virginia, Nev	June 12	July 3	0.25
Confidence, Nev	June 10	June 30	0.20
Lead King, Utah	July 1	July 28	0.01
Little Chief, Utah	June 17	July 7	0.01
Lucky Dutchman, Nev	June 30	July 20	0.01
Mountain Dell, Utah	June 24	July 13	0.02
N. Y. Bonanza, Utah	June 9	June 30	0.02
Oro Cobre, Cal	July 16	Aug. 3	0.02
Overman, Nev	June 19	July 10	0.05
Peruvian Con., Utah	June 22	July 7	0.01
Silver King Con., Utah	June 11	June 30	0.10
Spanish Ridge, Cal	June 1	July 1	0.05
Tomahawk, Nev	Julp 10	Aug. 12	0.01
Tonopah North Star, Nev	June 24		0.01
Union Con., Nev	June 15	July 9	0.10

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67 519	55 365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144		31.366	
August	68.745		31.637	
September	67.792		31.313	
October	62.435		28 863	
November	58 677		27 154	
December	54.565		25.362	
Year	65 327		30.188	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62 386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12 743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	22.665	12.675	24.140	12.877	97.272	57.842
July	21.130		21.923		95.016	
August	18.356		19.255		79.679	
September	15.565		16.047		68.375	
October	13.169		13.551		60.717	
November	13.391		13.870		61.226	
December	13.163		13.393		60.113	
Year	20.004		20.661		87.007	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	
February	42.102	28.978	August	37.667	
March	41.313	30.577	September	36.689	
April	40.938	31.702	October	32.620	
May	43.149	30.018	November	30.833	
June	42.120	28.024	December	27.925	
			Av. year	38.166	

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19 828	14.469
February	6.000	3.725	19.561	14 250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19 975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	4.466	20.188	12.600
July	5.288		20.350	
August	5.250		19.063	
September	4.813		19.775	
October	4.750		18.531	
November	4.376		17.281	
December	3.658		14.500	
Year	5.325		19.034	

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20 563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.535	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072		5.922		23.850	
August	5.701		5.551		21 969	
September	5.236		5.086		21.050	
October	5.430		5.280		21.781	
November	4.925		4.775		21.438	
December	4.254		4.104		20.075	
Year	5.962		5.812		23.771	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.